Smithsonian

MAY 1999

Into the Dragon's Throat

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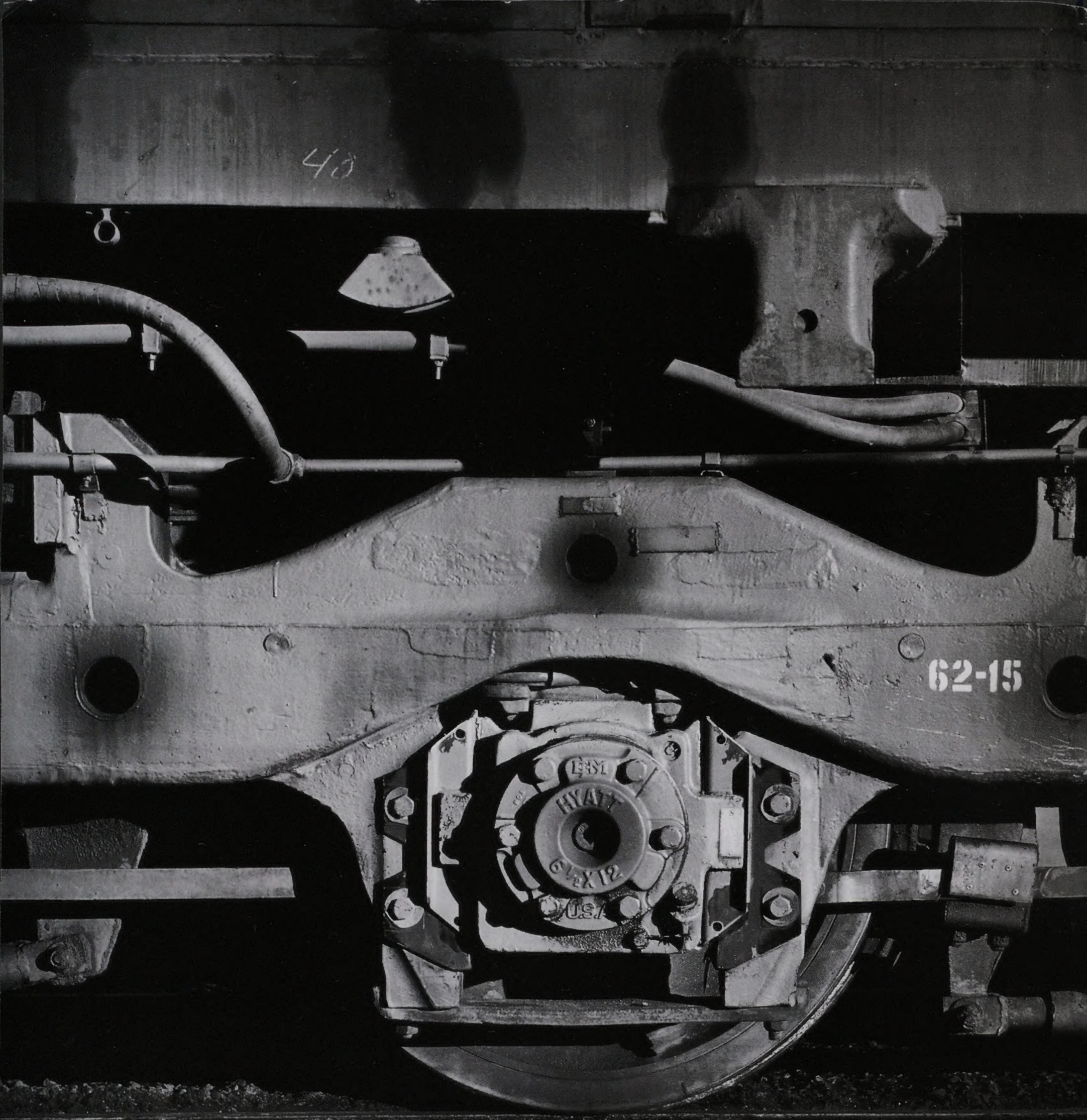

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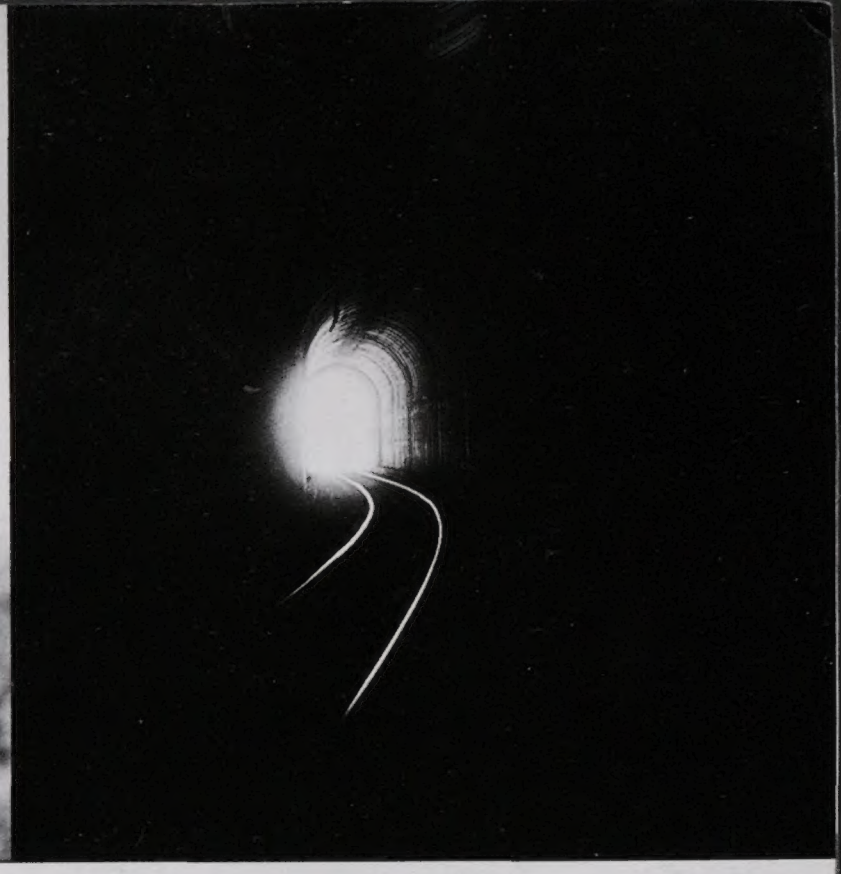

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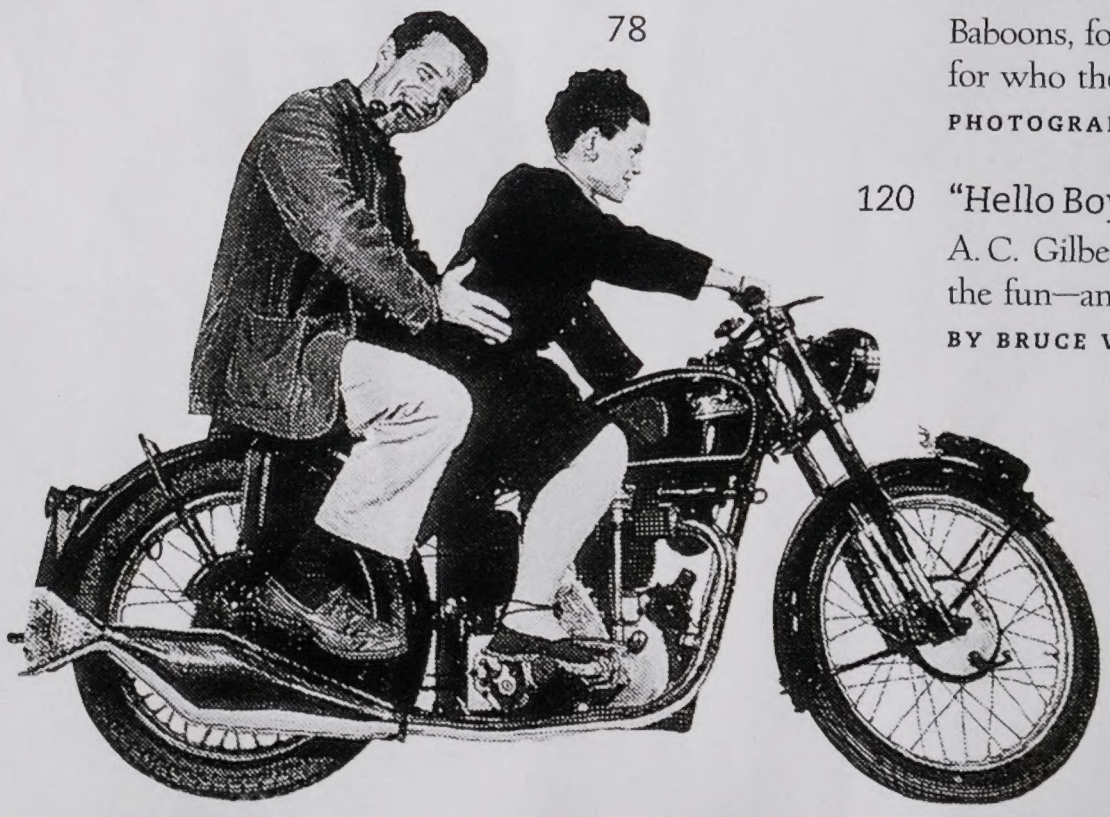

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departments

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Cover At Tucson, Arizona's Public Safety Academy, a captain, center, entrusts his life to recruits as they fight the "dragon," a prop that simulates a burning gas main. The recruits push the fire back with hoses until the captain can reach the turn-off valve.
PHOTOGRAPH BY DAN BUDNIK

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The Wonder of Iron-10

A meteorite was made into magnificent swords, with great difficulty in forging. They were called the Shooting Star Swords.

Messages From Space

By Yoshiyuki Matsuo

In 1890, a lone prospector discovered a lump of iron weighing 22.7 kg in a Japanese mountain range, a rock which is now on display at the National Science Museum in Tokyo. Several years after discovery, scientists learned it was an iron meteorite, so called because many meteorites have large iron contents.

However, about a quarter of the celestial rock has been cut out because a Japanese politician, Takeaki Enomoto, Foreign Affairs Minister at the time, bought the meteorite. He was particularly fascinated by the "iron from the stars." He had the iron meteorite made into a sword to present to the Crown Prince, later to become Emperor Taisho.

Although the meteorite was 89.5% iron, it also contained 9% nickel, and traces of cobalt, copper, tin, phosphorus, sulfur, and carbon, which made it very difficult to work with. Forging by folding it over and over did not go well. Forging had to be carried out after heating the sword white hot.

One long sword and two short swords were made by the process, and despite the difficulties, the steel from the meteorite had a magnificent finish, the pattern on the blade resembling knots in a piece of wood. Enomoto named these swords the *Shooting Star Swords* when he received them from the swordsmith, Kunimune Okayoshi, in 1898. He donated the long sword to Emperor Taisho. The Enomoto family kept the two short swords.

Meteorites retain the form they had at the time of the birth of the sun, and scientists continue to decode the messages that they bring about the creation of the earth.

About the Author:
Yoshiyuki Matsuo is a senior editor for Nikkei Science, *the Japanese version of* Scientific American. *His special interests in material science include quasicrystals, C_{60}, and superconductors.*

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40	$ 148	$ 183	$ 185	$ 263	$ 273
45	$ 200	$ 210	$ 265	$ 360	$ 393
50	$ 260	$ 305	$ 375	$ 535	$ 590
55	$ 380	$ 428	$ 578	$ 1,018	$ 1,065
60	$ 528	$ 675	$ 865	$ 3,140	$ 3,140
65	$ 838	$ 993	$1,633	$ 4,100	$ 4,100
70	$1,400	$ 1,637	$3,283	$ 5,270	$ 7,220
75	$2,797	$ 4,770	$6,560	$10,370	$10,370

Male Premiums

Age	10 YEAR	15 YEAR	20 YEAR	25 YEAR	30 YEAR
35	$ 138	$ 153	$ 178	$ 245	$ 273
40	$ 161	$ 199	$ 243	$ 345	$ 360
45	$ 240	$ 315	$ 375	$ 500	$ 523
50	$ 358	$ 483	$ 558	$ 798	$ 838
55	$ 535	$ 720	$ 848	$ 1,640	$ 2,810
60	$ 860	$ 1,070	$1,353	$ 4,100	$ 4,100
65	$1,453	$ 1,813	$2,850	$ 5,270	$ 5,270
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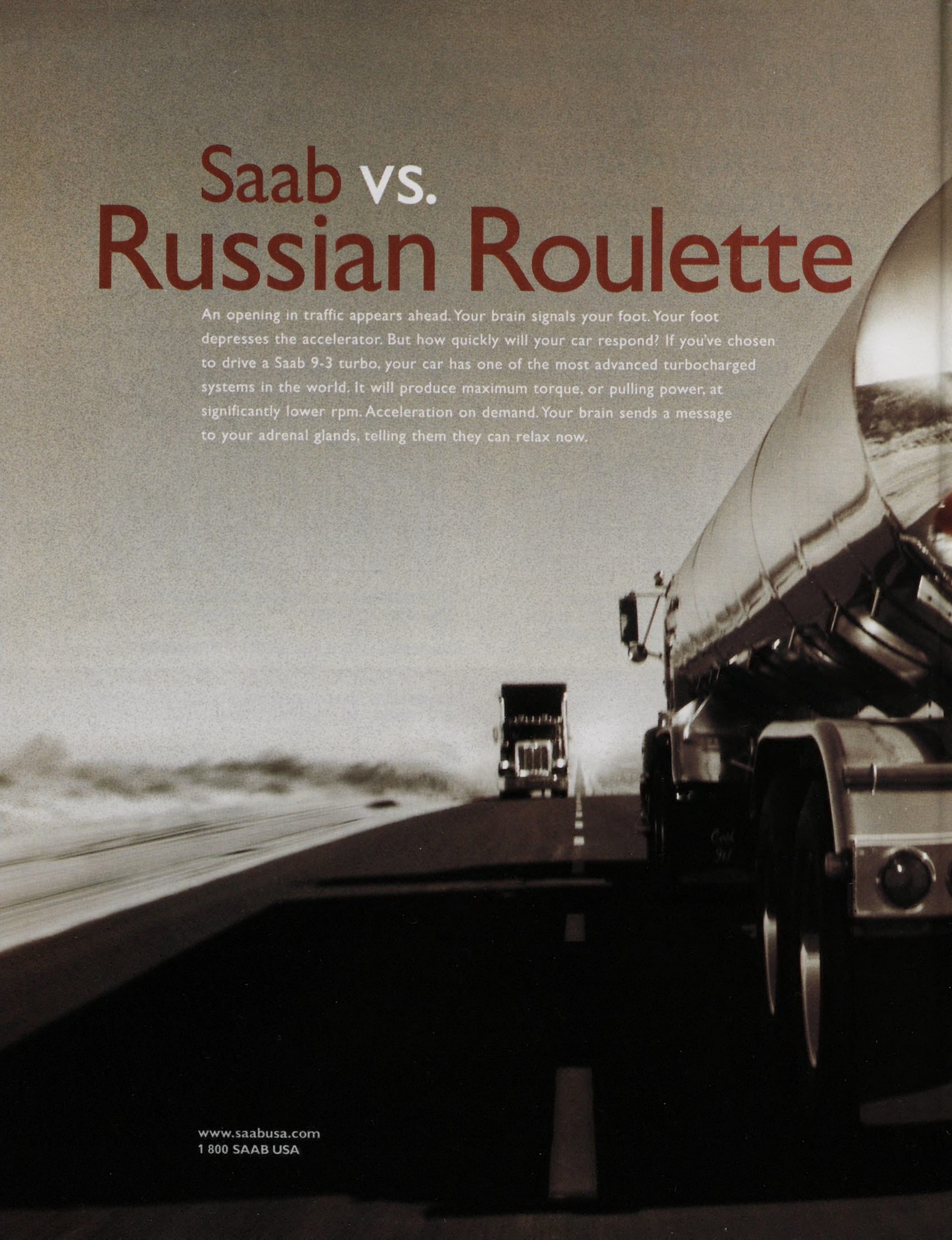

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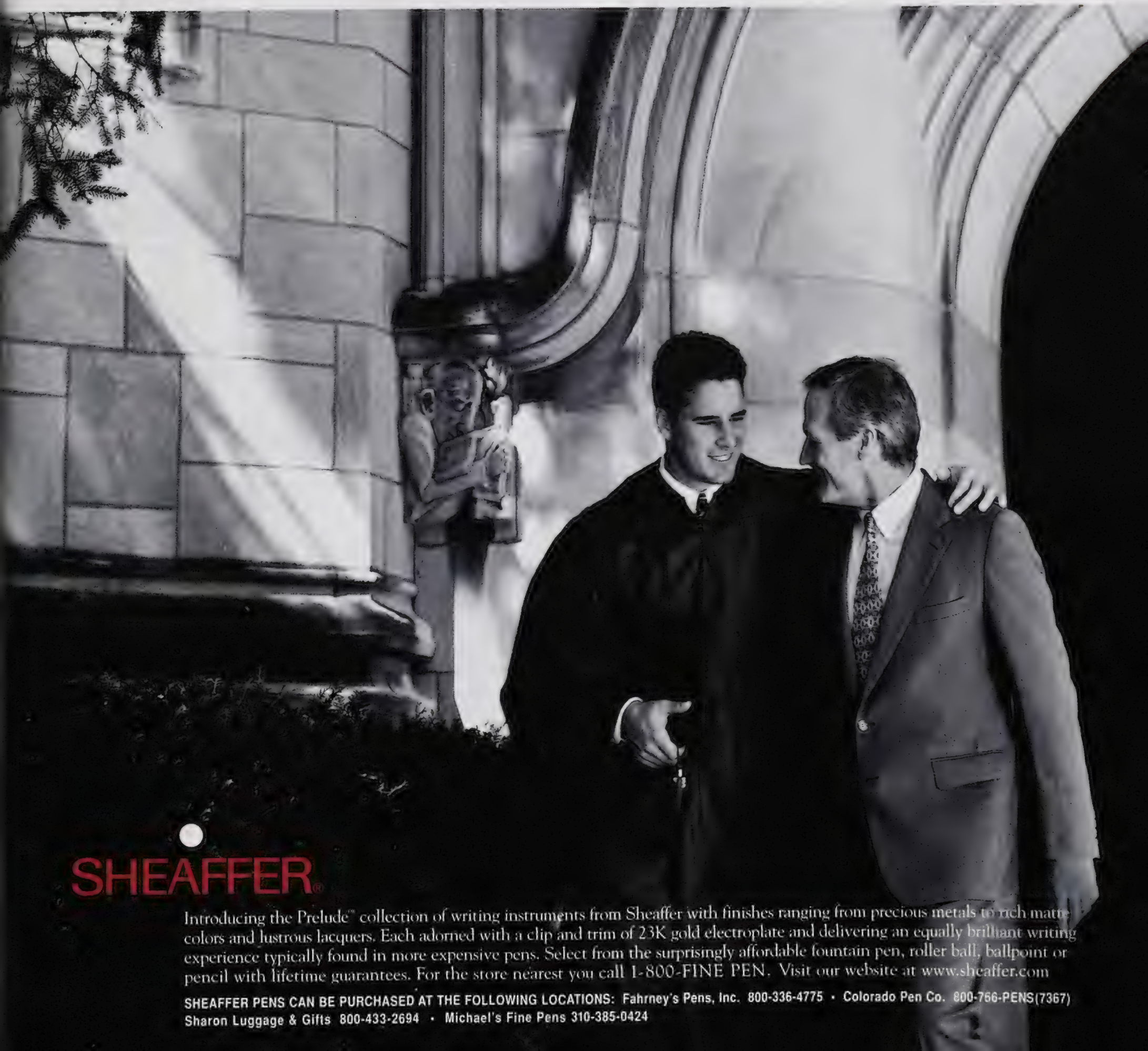

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SMITHSONIAN

PERSPECTIVES

Out of Africa and Onto The Mall—and Beyond

THE NATIONAL MUSEUM OF AFRICAN ART BEGAN AS A privately funded, modest but dynamic educational institution on Capitol Hill. It was founded in 1964 by Warren M. Robbins, a former U.S. Foreign Service officer, and its collecting interests were African-American and African art, history and culture. Initially it was located in the house that abolitionist and statesman Frederick Douglass lived in from around 1871 to 1878.

On August 13, 1979, the museum became part of the Smithsonian Institution, and its focus turned to the traditional visual arts of sub-Saharan Africa. A new facility was built on the Mall to provide adequate space for the museum's collections and activities, and opened to the public in September 1987. In 1994 the museum's mission was expanded to reflect the visual traditions, diverse cultures, and ancient and contemporary arts of the entire continent, including northern Africa.

An aggressive acquisition program, initiated in 1983, has resulted in the creation of a world-class collection that covers all aspects of pan-continental African visual arts—sculpture, painting, photography, printmaking, pottery, textiles, crafts, popular culture, architecture and archaeology.

The museum provides significant supporting facilities and materials for research. The archives, named for renowned photographer Eliot Elisofon, who created an enduring record of African life, houses more than 180,000 color transparencies and 80,000 black-and-white photographs, which document objects in the permanent collections of the museum and other repositories. There are also rare collections of original glass negatives, lantern slides, stereographs and vintage postcards. The library, a branch of the Smithsonian Institution Libraries, comprises 25,000 volumes that support research on all topics pertaining to African art, history and culture.

The museum has come to be recognized as the country's leading collecting, exhibition, research and reference center for the visual arts of Africa. Appropriately, it also contains a state-of-the-art conservation laboratory. This department serves as a national and international authority on the conservation of African art. Both the conservation and curatorial departments invite the public to bring their objects to the museum, by appointment, for identification and advice on taking care of them. The museum has also created a variety of educational programs. Through materials such as videotapes about African art and images of the museum's growing collections, the museum reaches out to teachers and students. Workshops and demonstrations by African and African-American artists engage audiences eager to meet and talk with practicing artists. Films offer contemporary perspectives on African life and art. Tours, storytelling, festivals and workshops engage both young and old through lively presentations that bring Africa's oral traditions, literature and art to life.

As the National Museum of African Art enters the new century, it seeks to improve existing programs and create new ones that will benefit the public. Supplementary funding would allow the museum to create a much needed orientation gallery, the primary objective of the museum in the forthcoming Smithsonian fundraising campaign. This gallery will provide visitors with an introduction to some of the unique aspects of African art, and increase their awareness of its presence in our everyday lives. Programs created for this facility can be redesigned in the form of videos and CD-ROMs for use as educational products and curriculum materials. Such funding would also provide seed money for traveling exhibitions that will extend the museum's reach beyond the Mall. In addition to a photography show that will be circulated by the Smithsonian Institution Traveling Exhibition Service in 2000, exhibitions of artworks that are appropriate for a limited tour could be created and shared with institutions in underserved communities.

The permanent collection is the heart of the museum and its reason for existence. Fine quality, authentic works of art are harder to acquire because the value of African art has escalated so much during the past decade. For this reason, gifts of funds and desirable objects are welcome.

With a lot of help from our friends, the National Museum of African Art will continue to fulfill its mission to foster interest in and understanding of the diverse cultures in Africa as these are embodied in aesthetic achievements in the visual arts.

I. MICHAEL HEYMAN, SECRETARY

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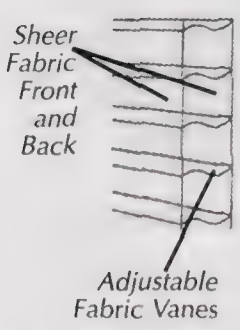

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AMERICA'S FIRST DOG

THANK YOU FOR THE ARTICLE BY Scott Weidensaul, "Tracking America's First Dog," which appeared in the March issue. In February 1983, a litter of semi-wild puppies staggered out of the South Carolina woods, hungry enough to overcome their fear, and snatched the food we had left for the farm dogs. We rounded up all but one and took them to the pound. One month later, the last one was starved enough to come eat. She was a skeleton in a puppy suit. After a few trips to the veterinarian with "George," I became her keeper.

She could crack peanut shells and eat the meat inside, and my barn soon had no mice. George routinely scooped out "snout pits." But she was so shy, especially around men. I tried to teach her to walk on a leash, but she screamed as if I were killing her.

People laughed at me for keeping one of those yellow "dumpster dogs," but then a man told us she looked like the Carolina Wild Dogs that a scientist was studying. The dogs in Lynda Richardson's pictures look just like George.

Last winter, George died. She had learned to be a city dog in Baltimore and to lead. But even near the end, she could still catch a mouse or a bird right out of the air. A rabbit had no chance, and she never met a dumpster she didn't like.

Kathy Dibben
Pasadena, Maryland

FOR MANY YEARS AS I TRAVELED THE world, I wondered how the same half-wild, half-starved dog kept turning up in such diverse places as India, Guyana and Egypt. It is always a shorthaired, middle-sized, pointed-ear canine with a prominent tail. Children torment the puppies; adults stone older members of the pack. Only the most intelligent and wary could survive. I named the breed "Universal Dog," but it turns out that it's right here in America.

Iris McKinley
Redondo Beach, California

I AM GRATEFUL TO YOU FOR MENtioning the New Guinea Singing Dog (NGSD), which we are working hard to save from extinction. The typical NGSD [below] is a lithe, rather short-legged 25-pounder. The underside of the tail carries a thick brush; the face

is distinguished by high cheekbones, a narrow muzzle and tulip-petal-shaped ears. Its triangular, obliquely set eyes glow bright green when reflected in low light. Many of the NGSD's vocalizations sound similar to the wolf, dingo and basenji; others resemble birdcalls. Its howl, for which it is named, is similar to a wolf's but with whale-song overtones.

Janice Koler-Matznick
NGSD Conservation Society
Primitive and Aboriginal Dog Society
Central Point, Oregon

WHILE ON VACATION IN ITALY A FEW years ago, I visited Pompeii and viewed the well-known *Cave Canem* mosaic in the entrance hall of one of the ruins. Later that day while touring the Villa of the Mysteries, I encountered a live version of the dog pictured in the mosaic. He could have stepped right out of the tiles.

Katherine L. Rogers
Concord, California

THOSE READERS WHO HAVE QUEStions about the possible role of thyroid hormone in domestication may like to know that I have two articles on this subject forthcoming later this year. For publication information, see our Webpage: www.pacificid.com.

Susan J. Crockford
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Victoria, British Columbia

BOOKSTORES

I ENJOYED BRUCE WATSON'S ARTICLE "Racing to Round Up Readers." More than 50 years ago, my family moved from a tall-woods logging camp to town. I read and repeatedly reread a book telling the story of another child taken from his pinewoods home and how he regained his birthright. The story gave me hope at the time, and the courage to endure and accept what couldn't be changed. As an adult, I always took a moment to check the shelves of used bookstores, looking for a copy of that book.

Last month I found *The Strength of the Pines* by Edison Marshall in Sam Weller Books, in Salt Lake City. Pulling that book out of the bottom shelf and opening it up to recognize that old, beloved story was a wonderful experience, one that could not be duplicated on-line.

Things are changing, but in my view, not for the worse. I immediately logged onto Amazon.com and was delighted to find several other titles by Edison Marshall.

Margaret Thornberry
Fremont, California

External Revenue Service

Auditing Division

P.O. Box 1209
Washington, DC 21345

Kevin Grealey, President
Huxbury Poultry Farms
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Easton, MD 21654

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FOR THOSE READERS WHO ARE UNable to make it to a "Booktown" but have access to the Internet, there are two other great sources that your article did not mention. Independent used and rare book dealers from around the world offer their inventories through two huge sites on the Internet: www.bibliofind.com and www.adebooks.com.

Joann and Grace Budka
Blinking Books
Copper Center, Alaska

BERTRAND SMITH FOUNDED CINCINnati's Acres of Books, and in 1935 he opened a huge used bookstore in Long Beach, California. His grandson, Phil Smith, owns Acres of Books, and I have the pleasure of running it.

Jacqueline Smith
Long Beach, California

METEORITES

I READ KEVIN KRAJICK'S ARTICLE "Mining for Meteorites" with great interest. I witnessed, and heard, a major meteorite impact 87 years ago when I was 17 years old. The well-documented "Holbrook meteorite" struck early on the evening of July 10, 1912, producing a tremendous explosion, the loudest thing I ever heard. I was fortunate enough to be standing outside with several members of my family. Since the fireball seemed to be coming right at us, we all thought we were going to die. It appeared to explode as it passed through a long cloud. We could feel the impact as fragments struck the earth some six miles away. My father and brother collected several specimens and were paid almost $2,000 for them, which was a huge sum at that time. My husband-to-be earned $400 for his finds.

Pauline McCleve
Tempe, Arizona

SWING DANCING

"THIS JOINT IS JUMPING" BY DOUG Stewart was a great article for one who experienced life during that era. I enjoyed even more the cover photograph by Gail Mooney. Its sheer exuberance, vibrant enthusiasm and joie de vivre made my day brighter every time I looked at it.

Sue Ainsworth
Bethesda, Maryland

ADD MY NAME TO THE LIST OF TWENtysomethings who are loving the swing-dance revival. It's so good to leave behind the nightclubs with the earsplitting, thumping bass and dancers gyrating solo in their own world, and I hope this spells an end to the dancing that was popularized by the Woodstock generation.

Joshua Hamilton
Santa Monica, California

MY BEST FRIEND, SINGER SHAWN "HI-FI Honey" Sobel, is pictured on page 62. She and her husband, "Lo-Fi" Lee, have been working hard to promote the swing scene on the East Coast. Swing dancing may be perceived as a passing fad and nothing but nostalgic whimsy, but I have attended many events that are sold-out and jam-packed with jitterbuggers from 16 to 90 years old.

Ginger Gries
Glenside, Pennsylvania

IN THE 1930S AND 1940S, BEFORE WE went to war, we jitterbugged on beautiful wooden floors at "The World's Only Corn Palace" in Mitchell, South Dakota. Paul Whiteman, Jimmy Dorsey, Fletcher Henderson, Lawrence Welk and many other orchestras played there. The bands are gone, but the Corn Palace and the memories remain.

Phil and Leontine Casey
Sedona, Arizona

WE ARE THE WEBMASTERS OF THE Internet site www.jitterbuzz.com. One cultural aspect of the swing revival not mentioned by Doug Stewart is the role the Internet plays. Check our links section and you'll gain

access to more than 1,000 Lindy-related sites all over the world.

Frank Morra and Carole Berghers
Washington, D.C.

IN THE SWING ERA, WE HAD QUITE a choice of music, depending on how much energy one had. The phrase at the time was: "Swing and sway with Sammy Kaye; swing and sweat with Charlie Barnett."

John Gumz
Piedmont, California

EMILY CARR

WHILE I AM NOT AN EXPERT ON ART, I am an authority on the correct name of the former art critic for the Toronto *Globe and Mail*. John Bentley Mays is my brother.

Annie Bentley Mays DuChateau
Plymouth, Massachusetts

PHENOMENA, COMMENT & NOTES

I WAS INSPIRED BY THE COMMENTS of John P. Wiley, Jr., in his column "When Clock Birds Sing." I, too, will do well to learn more about the birds and trees and flowers and butterflies and reptiles of home. I have already begun new hobbies. Every day I identify as many trees as I can on my morning walk. At night I study the phases of the moon. After trees and the moon, there is more than enough here for a lifetime of learning.

Perhaps, as a requirement for graduation, every eighth-grader should identify, in the field, the common flora and fauna in his or her own world, beginning with the front lawn. Even city children have parks, pigeons and those strange plants that grow unwanted in pavement cracks. An outdoor education could do more than textbook learning to bring our society in harmony with nature.

Clodius Willis
Gettysburg, Pennsylvania

DAIRY FARMS

I WAS DELIGHTED TO SEE A POSITIVE article about agriculture in Jay Stuller's "In the Land of Milk and Money." So often the popular press focuses on environmental concerns and animal rights issues without realizing that farmers are also concerned about those issues and truly care about the animals they work with and the land under their stewardship.

Diane Fish
Bremerton, Washington

YOUR ARTICLE WAS INTERESTING, BUT many of us still take issue with antibiotics and hormones being given to cows in this country. There has been a surge of resentment because milk from cows that have been given the BST hormone is not so labeled. The Food and Drug Administration may have concluded that the milk from treated animals is safe, but many of us are not so sure.

Some stores now carry "organic" milk. Our local dairy guarantees that its milk comes from cows that have not been injected with BST. And they deliver it to our door in glass bottles. You can't beat that.

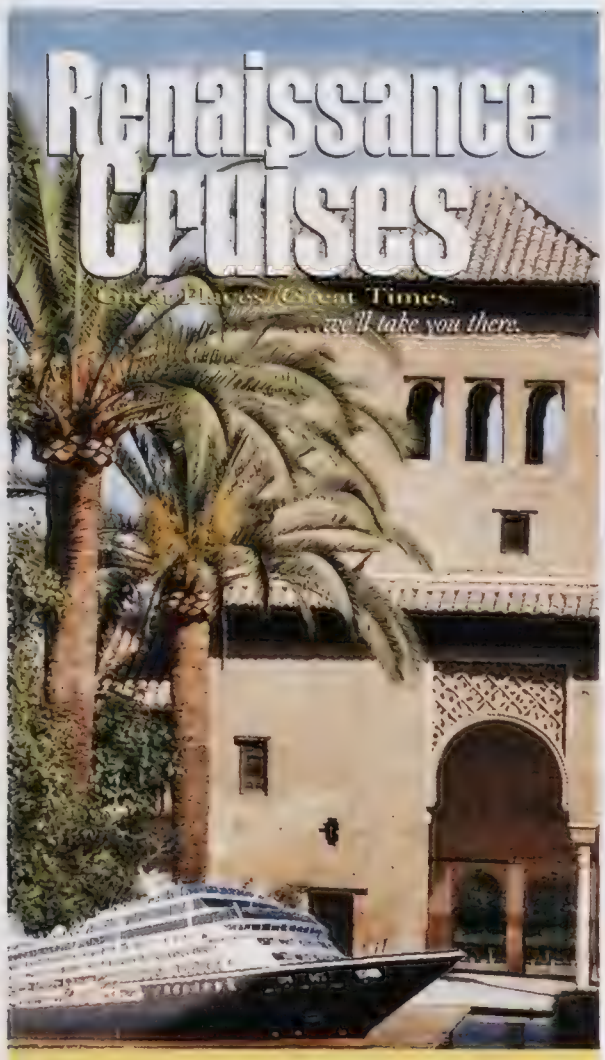
Charlotte B. Sornborger
Barrington, Rhode Island

JAY STULLER WROTE THAT "HUMANS are the only creatures that are weaned from their mothers and then continue to drink milk, albeit that of different species." This statement will be a great surprise to my cat, Tabby.

Gary Schinnell
Orem, Utah

WRITE TO SMITHSONIAN

Send all letters for consideration in this column to Smithsonian Letters Editor, P.O. Box 44400, Washington, D.C. 20026-4400, or to LettersEd@simag.si.edu. Letters may be edited for clarity and length. Send all other queries and comments to Smithsonian, 900 Jefferson Drive, Washington, D.C. 20560-0406, or see our Website: www.smithsonianmag.si.edu.



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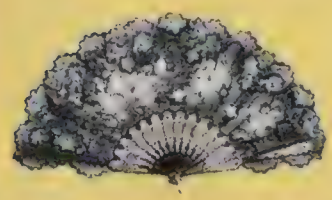

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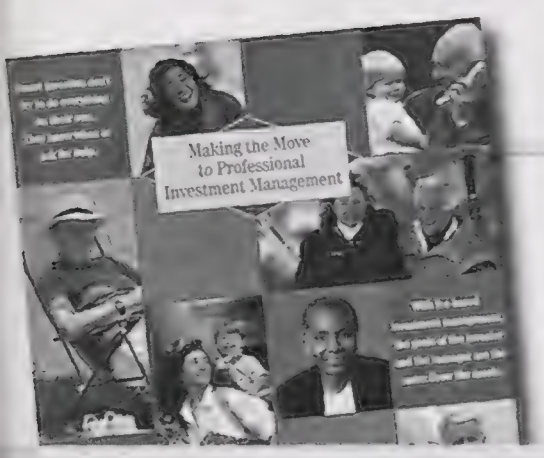

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New Light on Diversity

HOLES IN THE CANOPY MEAN OPPORTUNITY FOR NEW TREES, BUT ONLY IF THEY ARE ALREADY WAITING IN THE WINGS

BY JOHN P. WILEY, JR.

SUPPOSE A TREE FALLS IN THE FOREST, AND takes crashing down with it one of the tenets of ecology. Suppose more specifically this particular tree happens to fall inside a test plot on an island in the Panama Canal, and a team of ecologists are there not to hear it nor to see it, but to see what happens next. (The old conundrum about whether there is a sound when a tree falls and no one—no human, that is—is there to hear it is speciesism at its worst. Almost certainly some creature, backboned or not, perceived the acoustic waves produced by the crashing tree.)

One of the wonders of tropical forests is the sheer diversity of trees, with many times more species per acre than are found in temperate climes. (The same is true, of course, for birds and butterflies, ants and frogs.) A favorite explanation has been that lurking in the understory are seedlings and seeds of fast-growing species that explode toward the light when a treefall opens up the canopy so that suddenly, in one place, light reaches the ground, perhaps for the first time in decades or centuries. As time goes by, a succession of different tree species (with different light-gathering abilities) fill the opening in stages. The understanding was that an intermediate rate of gap formation would produce the most diversity, because there would always be gaps in various stages of filling in.

Well, apparently it's not that simple. Stephen Hubbell, a Princeton ecologist, has been working on this very theory for nearly 20 years on Barro Colorado Island in the Panama Canal, the central research site of the Smithsonian Tropical Research Institute (STRI). Hubbell and Robin Foster, who is now at STRI and Chicago's Field Museum, and Richard Condit (STRI), working with an international team of students from both Princeton and STRI, have painstakingly taken repeated censuses

Understory palms grow toward the light in a place where the fall of a tree has left a hole in the canopy.

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2. Distinguishing road signs at dusk?	❑	❑
3. Recognizing colors?	❑	❑
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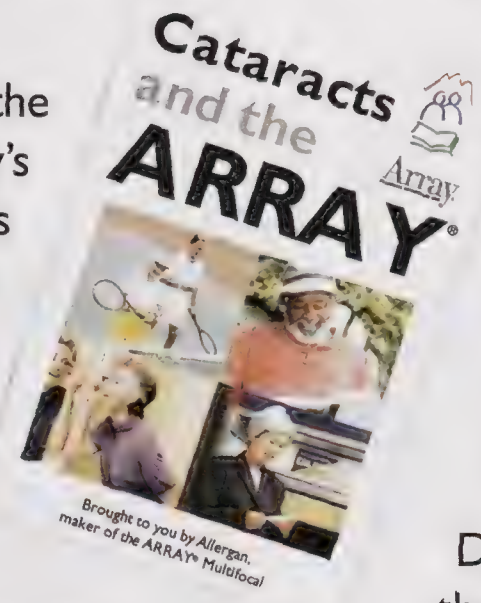

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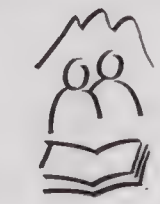

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Description

Allergan ARRAY® Multifocal Silicone Posterior Chamber Intraocular Lenses are available as biconvex optical lenses, with an anterior multifocal surface, designed to be implanted in the capsular bag. The optical portion has the capability of being folded prior to insertion, allowing the lens to be inserted through an incision of approximately 3.2 mm while preserving a full size lens body after implantation.

When implanted, Silicone Posterior Chamber Intraocular Lenses replace the natural lens of the eye and function as a refracting medium in the correction of aphakia.

Indications for Use

Allergan ARRAY® Multifocal Silicone Posterior Chamber Intraocular Lenses are indicated for the visual correction of aphakia in persons 60 years of age or older in whom a cataractous lens has been removed and who may benefit from useful near vision without reading add and increased spectacle independence across a range of distances where the potential visual effects associated with multifocality are acceptable.

Warnings

1. A very small percentage of patients (less than 1% in the US Clinical Study) have been dissatisfied to the point of requesting removal of the multifocal lens.
2. In a driving simulation study, under one of nine low contrast conditions, 22% more multifocal patients than monofocal patients did not notice a hard-to-see object in the road until they were closer than 100 feet. The distance of 100 feet is important because at speeds of 30 mph or faster, a driver may not be able to stop safely within 100 feet. In the simulation, however, drivers could also drive around objects, and there was no difference in collisions with the objects.

Precautions

1. There is a chance (11%) that your vision may not be good enough to read small print without glasses with the multifocal IOL.
2. Please discuss with your physician whether this is the right lens for you. The following may affect your choice of IOL:
   In rare instances, this lens may make some types of retinal surgery more difficult.
   If the pupil of your eye is very small (less than 2.5 mm), the chances are greater that your near vision with a multifocal lens will not be better than with a monofocal lens.
   If the health of your eye makes it unlikely that your vision will be good after your cataract is removed, you may not get the full benefit of the multifocal IOL.

Comparisons Between the Monofocal and Multifocal IOL

Both the monofocal and ARRAY® multifocal IOLs have been thoroughly studied and are designed to replace the natural lens of the eye. The following table compares the other features of these two types of implants.

	Monofocal IOL	ARRAY® Multifocal IOL
DISTANCE VISION	This IOL generally gives good distance vision.	This IOL generally gives good distance vision, but it may not be quite as sharp as with a monofocal IOL.
INTERMEDIATE VISION (between 2 and 5 feet)	Intermediate vision is expected to be comparable between these two types of IOLs.	
NEAR VISION	This IOL generally does not provide good near vision without glasses.	Most patients can expect near vision to be better than with a monofocal IOL, but there may still be some circumstances where you will need glasses for near work.
USE OF GLASSES	If you have this lens in both eyes, there is a 60% chance you will always wear your glasses for near work. There is a 34% chance you will wear your glasses all of the time (for any distance).	If you have this lens in both eyes, there is a 12% chance you will always wear your glasses for near work. There is an 8% chance you will wear your glasses all of the time (for any distance).
HALOS AND GLARE	With this IOL, there is a chance that you may have severe difficulty with halos around lights (6%) or with glare (1%).	With this IOL the chances of having severe difficulty with halos (15%) and glare (11%) are higher when compared to a monofocal IOL. You may grow accustomed to them or continue to notice them. In rare instances (less than 1%), patients have requested that the IOL be removed.
LOW CONTRAST VISION (DRIVING)	Under poor visibility conditions, your vision may not be as sharp as in good light.	Under poor visibility conditions, your vision may be further reduced than it would be with a monofocal IOL. Under these conditions you may have more difficulty recognizing some traffic signs and hard-to-see objects in the road. Therefore, you may need to take extra care when driving, especially in poor light conditions.

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of a 50-hectare (125-acre) plot. In 1982 and 1985, and again in 1990 and 1995, they tagged, measured, mapped and identified all woody plants with a diameter at chest height of one centimeter or more. It was an enormous undertaking, involving more than 300,000 trees of more than 300 species each time. Every year from 1983 through 1996, they measured canopy height and gaps on a grid of 20,301 sample points five meters apart. In particular, they followed the fortunes of 1,284 gaps from 1985 through 1995.

(There is now at STRI the Center for Tropical Forest Science, which coordinates similar studies at 16 other tropical sites in 13 countries. Scientists, all using the same methods so that the results are comparable, are following more than 2 1/2 million trees of more than 5,500 species.)

All that sweaty, totally unglamorous work has paid off.

"Spatial and temporal variation in the gap . . . regime did not explain variation in species richness."

In a paper in *Science*, Hubbell and seven coauthors reported that species diversity in gaps is no greater than it is in the surrounding forest. Until now, most tropical biologists believed that disturbances—such as treefall gaps—initiated a sequence where successional tree species replaced one another in the regrowth of the site. In forests that have many disturbances, most of the area is dominated by early pioneer species. In localities with infrequent disturbances, most of the forest is populated by late successional canopy species. With both these rates of disturbance, the diversity of species is low. But in a forest with a moderate amount of gaps, all at different stages of recovery and thus with a full range of successional species, diversity would be maximized. This explanation is known as the intermediate disturbance hypothesis.

It's time for rethinking. As the group wrote in *Science*, "Spatial and temporal variation in the gap disturbance regime did not explain variation in species richness." Hubbell and his colleagues lean toward a different explanation, that of recruitment limitation. Some trees do not disperse well: not many birds or animals carry their seeds far from the tree, nor does the wind. Some seeds simply do not germinate. Thus, when a gap forms, they may not be present in the immediately surrounding forest, and so there is no chance they will seize the opportunity. They're just not on the dock when their ship comes in.

In a commentary in the same issue of *Science*, David Tilman, a professor of ecology at the University of Minnesota, wrote: "Like a team that fails to appear at a sporting event, a species that is locally absent has forfeited any

"We're still in the Middle Ages in biodiversity research. We're still cutting bodies open to see what organs are inside."

chance of competitive victory at the site. This can allow inferior competitors to win by default. If there is recruitment limitation, the winners of local competition are not necessarily the best competitors that exist in the region, but the best competitors that happened to colonize a particular site. This can lead to essentially unlimited diversity."

Hubbell et al. have covered the recruitment-limitation base with ten years of data from seed traps and censuses of seedlings. More than a million seeds of the 260 main census species were collected and identified over those years, most by Osvaldo Calderón of STRI. In a census of 2,000 quadrats, each a square meter, the most commonly encountered species was found in only 15 percent of them. Three-fifths of the main species in the 50-hectare plot were completely missing. The seedlings were just as poor in diversity. Three-quarters of the main species counted in the seedling census were present in less than 1 percent of the quadrats. Poorer competitors end up winning places in gaps because more often than not the better competitors never show up. As a result, species richness measured in gaps is no greater than species richness in control sites.

If we used time-lapse photography to look at a large swath of forest, we would see light hitting the forest floor through treefall gaps as flashes, with the randomness of tempo and location like cameras flashing in a stadium. Gaps are real and they are important for most species of trees to reach maturity, but they are not the primary explanation for the riches of tropical forest diversity.

The finding has immediate application. According to John Terborgh, codirector of Duke University's Center for Tropical Conservation, in North Carolina, it has been suggested that logging could be allowed in forests if it followed the natural pattern of light gaps. Done this way, logging would actually promote diversity, the argument ran. Now, Terborgh says, we know the proposal was based on a misunderstanding.

For Hubbell, finding out that something we "knew" was not so came as no great surprise. "We're still in the Middle Ages in biodiversity research," he has said. "We're still cutting bodies open to see what organs are inside."

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"A Durable Memento"

AN UPCOMING EXHIBITION HONORS THE LEGACY OF AN AMERICAN ARTIST WHO FOUND FREEDOM IN LIBERIA

BY MICHAEL KERNAN

SOMETIMES YOU FALL IN LOVE with a subject and can't stop yourself: you track down every tiny lead, every obscure reference, every footnote until you feel like a maniac. Remember the character in George Eliot's *Middlemarch* who never could end his research and died with his lifework unwritten? A deadline helps. Ann Shumard has to finish her research on daguerreotypist Augustus Washington in time for the exhibition about him opening September 24. Already she is forcing herself to organize the material she has on hand. And there is a lot.

In 1996 the National Portrait Gallery (NPG) bought Washington's daguerreotype of John Brown, the earliest known likeness (SMITHSONIAN, August 1997). Public response was so enthusiastic that the curators decided to try to arrange the first exhibition of Washington's work.

When she started the research, Shumard, NPG's assistant curator of photographs, knew little about Washington except that he was a free black man who worked as a daguerreotypist in Hartford, Connecticut, and later immigrated to Liberia.

Published material was limited, but she found two articles focusing on Washington's years in Hartford, which led her to the Connecticut Historical Society, a source of more Washington daguerreotypes and research material. Another article gave Shumard her first detailed look at Washington's life in Liberia. Things were beginning to take shape.

Determined to find connections between the artist and his subjects, Shumard didn't stop with the information at hand. "Full biographical information on the sitters had not been gathered," recalls Shumard, who spent several days copying information from the Connecticut Historical Society's genealogy collections, bound newspaper volumes and scrapbooks.

Sarah Waterman, who sat for Washington in Connecticut, was probably killed by pirates while sailing for Canton, China.

The fate of one sitter, Sarah Waterman, was surmised in the *Hartford Weekly Courant*. The niece of a successful insurance pioneer, she married a sea captain, was shipwrecked with him off China on an island whose inhabitants were "pirates almost by profession," and was most likely murdered, the paper reported. And then, in the Connecticut State Library, Shumard found a treasure that she had seen cited in a footnote: a published letter by Washington telling the story of his early life.

It's not hard to imagine Shumard's excitement. Even in recalling the moment, her eyes flash. It's not often that we get to hear the actual voice, even on paper, of people buried in the past.

"Well, I copied that letter down," she tells me, "and then I came across other letters he'd written. I whirled so much microfilm past my eyes that I got seasick. It was so important to me to contribute something beyond what others had discovered. And no one had told his complete story from start to finish."

His life story is part of what Shumard hopes to share in the NPG exhibition "A Durable Memento: Portraits by Augustus Washington, African American Daguerreotypist."

Augustus Washington was born in Trenton, New Jersey, in 1820 or 1821. His father had been a slave in Virginia. His mother was a native of South Asia, but he says no more about her. She probably died young.

His stepmother, described by Washington as "an excellent Christian woman of Indian, white and negro extraction," had also been a slave.

"I wondered if Washington's father would turn up in the 1830 census," Shumard says, "so I got a Smithsonian volunteer, Christopher Saks, to comb through the microfilmed census ledgers at the National Archives. And he found a Christian Washington, the only free African-American male with that surname residing in Trenton, with a wife, son and daughter. Augustus did have a sister. It all seems to match, but further research is needed," Shumard warns.

Slowly, as one source led to another, the story emerged. Washington went to school in Trenton, where he was rebuffed at age 12 or 13 when he tried to buy a Latin grammar ("Won't English books do for you?" the bookseller asked). He eventually fell victim to the increasing polarization of the country over slavery. Told he could come to school only after the white students left, he wound up teaching other African-Americans in a school he organized himself.

An abolitionist advised him to go to the renowned Oneida Institute in Whitesboro, New York, where he continued his studies, and after more struggles he was admitted to Kimball Union Academy in New Hampshire, moving on to Dartmouth College there in 1843. He was the only black student enrolled there at the time.

"That winter—the college took a three-month winter break—he had to make money to pay his educational costs, so he learned the daguerreotype business," says Shumard.

But he could not pursue both the business and his studies. Unable to meet his college expenses, he left Dartmouth in the fall of 1844.

Washington taught in Hartford for a while, then opened a daguerrean studio there in 1846. Shumard discovered what is believed to be his first advertisement, in a Hartford newspa-

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Daguerreotypes made in Liberia include an unidentified female sitter and Senator Edward J. Roye, later president of Liberia.

per from December 24, 1846. (Previous researchers thought his daguerrean activity there began in 1847.)

Business was good, but the country was beginning to fall apart. With the enactment of the Compromise of 1850 and the Fugitive Slave Law, life for free blacks became more dangerous. Even a freeborn businessman in New England could be snatched off the street and claimed as a slave.

Washington, who married in 1850, had long considered finding a place where African-Americans could develop and prosper unfettered by racism. He now decided to go to the already established republic of Liberia. Settled by the first African-American immigrants in 1822, Liberia had become an independent republic in 1847. Washington sailed for Liberia with his wife and children in 1853. He took along his daguerrean apparatus.

At this point, the journal of the colonization society that founded Liberia, the *African Repository*, provided the researcher with great riches. For this self-made man soon became a leader in his new homeland. He developed a large farm on the Saint Paul River. He traveled to Gambia, Senegal and Sierra Leone to make pictures during the wet season, returning to farm his sugar plantation in the dry months. He employed up to 60 workers and built a brick house for his family. Then he was elected to the Liberian House of Representatives, became its speaker and moved up to the Senate.

"I found him mentioned repeatedly in the *African Repository*," Shumard says, "and I read so much that I got to recognize references to him even without the name. Visitors would describe in letters how they met him and his wife at his home in the White Plains settlement. Then I found what I was looking for, which no one seemed to know: a report of his death."

It was a great day for research but a sad day for the researcher. "I didn't know whether to pop champagne or hang crepe," she says. Washington, by this time owner and editor of the *New Era* newspaper, died at Monrovia, the capital, June 7, 1875. His passing was described in the *African Repository* as "a calamitous event for his family and a severe loss to Western Africa generally."

So far, no one has found an image of the photographer. But the portraits we do have are revealing. The celebrated portrait of John Brown, taken when he lived in Springfield, Massachusetts (1846-48), shows a flag believed to be the banner of Brown's proposed Underground Railroad organization.

Many of the Hartford images reflect the popular poses of the day. The Hartford men generally are posed frontally with one forearm resting on a table, the other on the thigh. Women are turned slightly, their heads often tilted. No one smiles: a daguerreotype was a rare event in most lives, and one didn't want to go down in history grinning. Besides, the exposures took 5 to 15 seconds.

Carol Johnson, an assistant curator at the Library of Congress, has made an intriguing discovery about daguerreotypes of Liberian statesmen attributed to Washington in the library's collection. The rather eccentric poses match those in a watercolor study that she unearthed for a major group portrait of the Liberian Senate. Thus, Senator Roye (left) stands with his hand raised in gesture just as he appears in the watercolor study depicting the Senate in action. Others, seated at their desks, also assume the same poses in both the daguerreotypes and the study.

Shumard has advertised for Washington's daguerreotypes in the Daguerreian Society newsletter and has had responses from collectors in California and Massachusetts. And, from a collector in New York, the Smithsonian has acquired a significant group of Washington's images, several of which will be displayed in the exhibition, which runs until January 2, 2000.

"I hope the show will bring some more Augustus Washington daguerreotypes out of the woodwork," Shumard says. Research is forever.

LIBRARY OF CONGRESS, PRINTS & PHOTOGRAPHS DIVISION (2)

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The Bird Did Its Part

DURING THE GREAT DEPRESSION, THE BLUE EAGLE WAS A SYMBOL OF THE NATIONAL RECOVERY ADMINISTRATION

BY T. H. WATKINS

THE BRIGHT-BLUE POT-METAL bird was lately seen in the National Museum of American History exhibition "Between a Rock and a Hard Place: A History of American Sweatshops, 1820-Present," which is scheduled to open at the Museum of Tolerance in Los Angeles in September. Crudely done, it stands about six inches high with a wingspread of almost six inches, yet the humble statuette still wonderfully evokes one of the most revolutionary programs in American history. It comes from the time when President Franklin D. Roosevelt and his New Dealers were frantically struggling to repair the economic ravages of the Great Depression.

FDR had warned in his first inaugural address, on March 4, 1933, that he might ask Congress for virtual wartime powers to overcome the disaster that followed the Crash of 1929. Roosevelt never went quite that far, but on June 16, 1933, he did sign something called the National Industrial Recovery Act. The law established the National Recovery Administration (NRA) and gave the new agency unprecedented peacetime powers. It could negotiate wage, hour and price codes with business and industry as a means to end cutthroat competition, with a view to ensuring shorter hours, better wages and fairer labor standards.

To head the agency, Roosevelt chose Hugh S. Johnson, a crusty former brigadier general who had directed the Army's Purchase and Supply Branch during World War I. Johnson immediately agreed to take on the task, though when the story broke he waved off congratulations. "This," he told friends, "is just like mounting the guillotine on the infinitesimal gamble that the ax won't work."

With manic energy Johnson crafted individual code agreements with textile, coal, automobile and other major industries. The process took too long for the ever-impatient general. He soon persuaded FDR to approve a voluntary "blanket code" that businesses and industries could sign as an interim measure until individual codes could be negotiated and then signed by the President. The code would waive antitrust laws for any business that agreed to abolish child labor and institute a minimum wage of from $12 to $15 a week, at a time when $5 for a 50- or 60-hour week was not uncommon. It also would establish a 35-hour week for blue-collar workers and a 44-hour week for white-collar workers.

To promote the NRA, Johnson decided he needed some kind of symbol "designed for visibility and uniqueness," as he put it. The result was the image of a Blue Eagle patterned after the thunderbird ideogram used by the Navajo Indians. Any business that signed a blanket code was entitled to display the blue bird logo and its motto, "We Do Our Part," with pride. As poster, flag, banner, window sign, windshield sticker, billboard, magazine cover, editorial cartoon—or pot-metal fetish—the Blue Eagle of the NRA seemed destined to become an enduring sign of the times.

For a while, there was no escaping the bird. Towns all over the country got on the Blue Eagle bandwagon. A hundred thousand schoolchildren clustered on Boston Common and were led in an oath administered by Mayor James Michael Curley: "I promise as a good American citizen to do my part for the NRA. I will buy only where the Blue Eagle flies." In San Francisco, 8,000 schoolchildren were dragooned into showing their allegiance by forming themselves into a human Blue Eagle on the outfield in Seals Stadium. In Cleveland, 35,000 enthusiasts gathered in the public square to cheer the unveiling of the Blue Eagle flag while city officials proclaimed the "end of the depression." In Memphis, 125,000 people watched another 50,000 march in the city's traditional Christmas parade; on the final float Santa Claus

JEFF TINSLEY, SI

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sat resplendent upon a big Blue Eagle, from which perch he threw candy to children. In a New Orleans park, NRA celebrants erected an enormous pyramid on which were inscribed the names of more than 7,000 people and businesses who had taken the pledge; on top of the pyramid was a nine-foot eagle made of blue lights, while red and white bulbs spelled out "We Do Our Part."

In Philadelphia, citizens were soon cheering for a new professional football team whose name was inspired by the general's icon: the Philadelphia Eagles. In Roanoke, North Carolina, "Shanghai Mickey" offered Blue Eagle tattoos for a mere 50 cents. In Atlantic City, beauty contestants had the Blue Eagle stamped on their thighs.

Big Hollywood studios signed up, too. The Blue Eagle soon could be seen "at a theater near you," not only in newsreels but sometimes even in the feature film itself. In the Warner Bros. musical *Footlight Parade*, starring singer Ruby Keeler, a chorus line using flash cards flips up a portrait of Roosevelt before marching into formation to create a huge NRA eagle.

From Washington, General Johnson issued blizzards of press releases, scowled authoritatively in newsreels and went on the radio frequently to growl about the need for America to sign up. Much of the time, however, he was sitting at a desk that the Army Air Service had installed in the cabin of a big Curtiss Condor airplane, writing speeches while he bounced through the air from city to city.

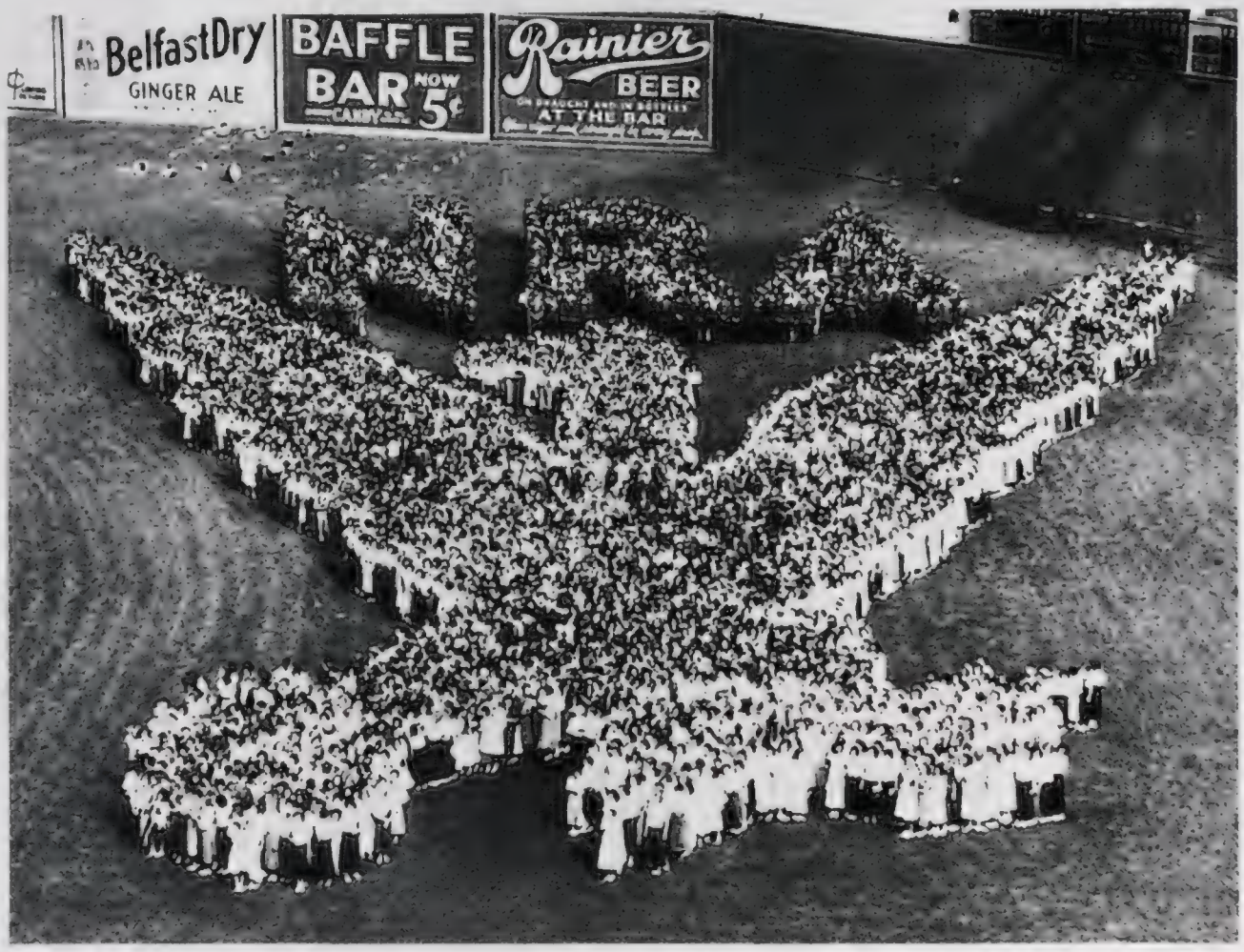
For a while it all seemed to work. By the beginning of September 1933, more than two million businesses had signed blanket codes and collected their Blue Eagles. In spite of all the hoopla, though, the NRA was in trouble, the butt of savage criticism from political conservatives and business people. Senator Gerald Nye of North Dakota spoke for them when he described the Blue Eagle as a "bird of prey on the masses." Henry Ford simply refused to have anything to do with it. Others lampooned the NRA initials, claiming they stood for such things as "No Recovery Allowed" or the "National Run Around."

A large part of the problem was the old general, Hugh Johnson himself. Burly, blunt, often tactless and profane, with a face that might be described as "40 miles of bad road," he chain-smoked Old Golds, drank too much and too often, and sometimes vanished into an alcoholic void. He had a close relationship with his assistant, Frances "Robbie" Robinson, that many assumed was more than just professional. Johnson was married; Robinson was not.

Once when newspaper reporters questioned him about Robinson's high salary, Johnson replied that she was "no mere stenographer." The next day, this information was translated in the newspapers as "more than a stenographer." "Boys," Johnson complained, doing himself no good at all, "you're hitting below the belt."

His erratic behavior created a bureaucratic shambles at the agency. Presidential adviser Adolph Berle wrote in a memo to himself in August 1934 that the NRA was "practically over," with "about half the men resigning, largely because of the affair between Johnson and 'Robbie.'"

Roosevelt accepted Johnson's resignation not long thereafter, then attempted to reorganize the agency. But the NRA was still floundering when the Supreme Court stepped in. On May 27, 1935, it ruled that the code system was an unconstitutional delegation of legislative power to the executive branch of the government, and the NRA, reduced to a shadow agency, soon vanished, taking the blue eagle with it.



In a spectacular demonstration of popular support—one of dozens around the country—8,000 schoolchildren in San Francisco's Seals Stadium flesh out the Blue Eagle.

UPI/CORBIS-BETTMANN

T. H. Watkins, a professor at Montana State University, is the author of a new history of the Great Depression, The Hungry Years, *due out in September.*

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A Place for Everything and . . .

. . . EVERYTHING IN ITS PLACE. JUST AS IT was, the Shakers argued, in Heaven. They sanctified labor; perfection could be achieved, even in the material world. But aesthetics were shunned—ornamentation fueled vanity. Furniture was to be made "without superfluity," utilitarian, for communal use. Mechanically ingenious, the sect invented the circular saw, a screw propeller, the metal pen, clothespins and hundreds of other devices. For its carpenters, the purity of form in the above tool cupboard (c. 1840) was a moral statement. Surely, secretly, they also relished its visual beauty. By the 1840s the Shakers numbered 6,000. But they are celibate—today only 7 remain. "Shaker: Furnishings for the Simple Life" is on view at the Renwick Gallery through July 25 and, in part, at www.smithsonianmag.si.edu. —*Bruce Hathaway*

SMITHSONIAN HIGHLIGHTS

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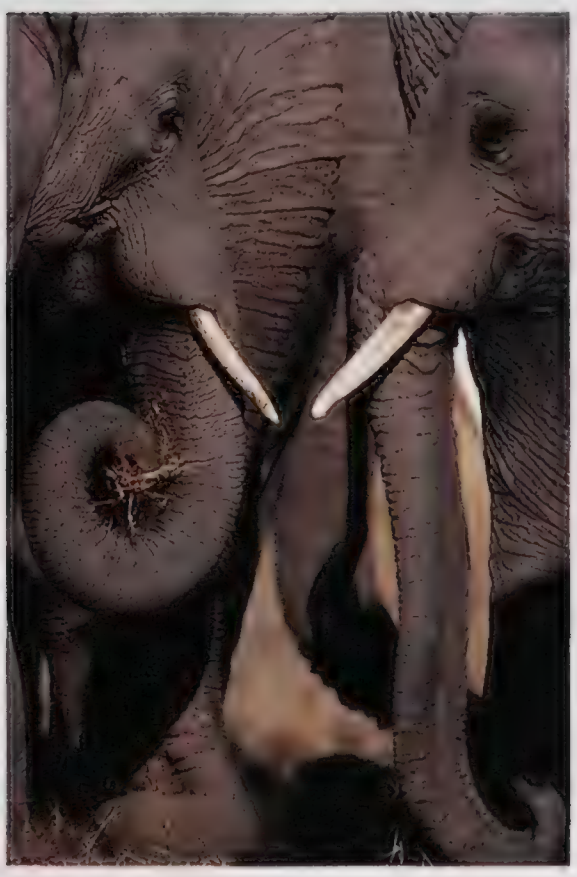
SMITHSONIAN HIGHLIGHTS

3-D IMAX—and more

NEW DISCOVERY CENTER

This month, one of the world's premier IMAX theaters, featuring a combination of state-of-the-art technologies never before offered in a similar venue, will open at the National Museum of Natural History. The Samuel C. Johnson Theater will be capable of projecting high-definition film, which runs at 48 frames per second. For 3-D presentations, viewers



will put on special glasses fitted with polarized filters. *Africa's Elephant Kingdom*, a 2-D IMAX film produced by Discovery Channel Pictures, will be the inaugural film. The picture above is a still from the movie. The theater's first 3-D IMAX film, *Galapagos*, a Smithsonian Institution and Imax Ltd. production, will premiere in the fall. The theater is part of NMNH's new Discovery Center, one of the most ambitious construction projects in the history of the Smithsonian; the name recognizes a generous donation from Discovery Communications, Inc. The center also offers expanded museum shops and the Atrium Café. Situated under a magnificent 2½-story-high domed ceiling, it will accommodate 600 visitors. The center, including the new theater, opens on May 12. For information, call 202-633-7400 or visit www.nmnh.si.edu/museum/DiscoveryCenter.

"Americanos"

PICTURES OF LATINO LIFE

The traveling exhibition *Americanos: Latino Life in the United States* begins its national tour at the National Museum of American History, where it will be on view through June 6. The show's 120 photographs are grouped according to themes such as family, community, education and sports. Organized by the Smithsonian Institution Traveling Exhibition Service and the Smithsonian Center for Latino Initiatives, the exhibition is accompanied by an HBO documentary special, a CD and a book.

SMITHSONIAN Website

WWW.SMITHSONIANMAG.SI.EDU

Another place to start finding out about the exhibitions, events, publications, programs and activities of the Smithsonian is our Website. There you will find the *Highlights Calendar* with links to the many pages of the Smithsonian Institution Website.

Exhibitions, Events

ANACOSTIA MUSEUM

Locating the Spirit: Religion and Spirituality in African American Art (through June 15) More than 115 paintings, photographs, sculptures and prints by 70 artists.

COOPER-HEWITT, NATIONAL DESIGN MUSEUM

[NEW YORK CITY]

The Huguenot Legacy: English Silver 1680-1760 (through August 8). One hundred outstanding examples of 17th- and 18th-century English silver, the world's most important private collection of Huguenot silver.

The Window Show (May 14 through 21) Displays in store windows at 14 of New York's top stores celebrate the history of store window design and the work of both lesser-known window dressers and legends such as Salvador Dalí and Charles and Ray Eames. Walking tours, panel discussions and lectures will complement this sidewalk exhibition. For information, call 212-849-8384.

HEYE CENTER, NATIONAL MUSEUM OF THE AMERICAN INDIAN

[NEW YORK CITY]

Pomo Indian Basket Weavers: Their Baskets and the Art Market (through August 15) Display of 110 baskets and 100 historical photographs examines the effects of the art market on the lives of 50 Pomo women, their families and their communities.

NATIONAL MUSEUM OF AFRICAN ART

Sokari Douglas Camp: Church Ede, A Tribute to Her Father (through June 20) Installation of *Church Ede*, a monumental kinetic sculpture reminiscent of a Kalabari funeral bed, by the Nigerian artist.

NATIONAL MUSEUM OF AMERICAN HISTORY

Preserving the Star-Spangled Banner: The Flag that Inspired the National Anthem (opening in early May) Specially designed windows will allow visitors to observe the three-year-long conservation process.

Santo Pinholé (through September) A 1992 painting based on New Mexico traditions honors Ansel Adams' con-

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PATIENT INFORMATION ABOUT LAMISIL® TABLETS

Generic name: terbinafine (tur-bin-uh-feen)
Please read this as well as any other information your doctor gives you about LAMISIL® (terbinafine HCl tablets) Tablets and fungal infections of the toenail or fingernail. Only a doctor or other qualified healthcare professional has the training necessary to determine if LAMISIL Tablets are right for you.

What are LAMISIL Tablets? LAMISIL Tablets are a prescription medicine for the treatment of onychomycosis (on-ee-ko-mi-ko-sis).

What is onychomycosis? Onychomycosis is a fungal infection of fingernails or toenails. Because the fungus infects the area underneath the nail and in the place where the nail forms, it can be very stubborn and difficult to cure. The infection may cause some or all of the following: the nail can turn colors like white, yellow or brown, and become thickened and brittle. Additionally, it may be painful for some people.

How do LAMISIL Tablets work? When you take LAMISIL Tablets, the active ingredient, terbinafine, travels to the infected area under the toenail or fingernail. Because terbinafine accumulates and lingers in the area of the nail that is growing, it can continue to work for months even after your prescription is finished, allowing the nail to heal naturally over a period of time.

How to take LAMISIL Tablets Patients take one 250 mg tablet per day (it may be taken with or without food). You should follow your doctor's advice on how to take LAMISIL Tablets. Be sure to take the complete course of your medicine. For toenail infections, treatment time is 12 weeks. For fingernail infections, treatment time is 6 weeks. It is important to note that the complete healing process often takes at least 10 to 12 months for toenails and 4 months for fingernails. This is due to the length of time it takes for the new nails to grow in.

Who should not take LAMISIL Tablets LAMISIL Tablets should not be taken by anyone allergic to any of its ingredients.

You should be aware of these warnings and precautions when taking LAMISIL Tablets

- As with all medications, you should discuss any side effects you experience with your doctor or healthcare professional.
- Rare instances of serious liver problems or skin reactions have been reported in patients using LAMISIL Tablets. In such cases, treatment with LAMISIL should be discontinued. Your doctor may ask you to undergo tests before and during treatment with LAMISIL Tablets.
- In clinical studies, 0.9% of patients taking LAMISIL Tablets discontinued therapy because of a skin rash. In rare cases, these skin reactions could indicate a serious side effect. If you notice a rash, stop taking LAMISIL and call your doctor.
- Isolated cases of decreases in white blood cell count have been reported. In all of the reported cases to date, these have been reversible.
- Patients with liver disease or kidney problems should not take LAMISIL Tablets.
- If you have problems with your immune system, your doctor may need to monitor your white blood cell count carefully if you take LAMISIL Tablets for more than 6 weeks. In some cases, LAMISIL therapy may need to be discontinued.
- Changes in the retina and lens of the eye have been reported following the use of LAMISIL. The significance of these changes is not known. In clinical studies, 0.9% of patients discontinued taking LAMISIL because of visual disturbances.
- The tumor-causing potential of LAMISIL has been examined in numerous studies in mice, rats, dogs, and monkeys. Male rats, given a daily dosage approximately 13.8 times the maximum recommended human dose based on body weight, showed a marginal increase in the incidence of liver tumors. No increase in tumors was noted in a wide range of studies in mice, dogs, and monkeys. These tests suggest that this is a finding specific to rats.
- No studies with pregnant women have been done to evaluate the safety of LAMISIL Tablets. Because treatment of onychomycosis can be delayed until after pregnancy is completed, LAMISIL Tablets should not be taken by pregnant women.
- The active ingredient of LAMISIL Tablets, terbinafine, is present in the breast milk of nursing mothers. Therefore, LAMISIL Tablets should not be taken by nursing mothers.
- No studies have been done in children to evaluate the safety of LAMISIL Tablets.
- Talk to your doctor or healthcare professional before combining LAMISIL Tablets with any other medications. Certain medications, including Tagamet*,* Seldane†,† and rifampin may affect the rate at which LAMISIL is eliminated from the body. However, unlike some other antifungal medications, LAMISIL Tablets has been used safely with many commonly prescribed medications, such as Seldane†, Lanoxin‡,‡ or Coumadin§,§.

Possible side effects Most patients tolerate treatment with LAMISIL Tablets very well. However, like all prescription drugs, LAMISIL Tablets may cause some side effects in some people. These side effects, as determined by three clinical studies, were mild and in general did not lead to discontinuation of treatment with LAMISIL Tablets. The most commonly reported side effects were headache, which occurred in 12.9% of patients, gastrointestinal symptoms, including diarrhea (5.6%), upset stomach (4.3%), taste disturbances (2.8%), nausea (2.6%), abdominal pain (2.4%), flatulence (2.2%), rash (5.6%), itching (2.8%), hives (1.1%), and abnormalities in laboratory tests of liver enzymes (3.3%). In some cases, these complaints were no more frequent than in patients taking placebo (sugar pill).

LAMISIL Tablets were prescribed only for you. Do not share LAMISIL Tablets with anyone else. Keep LAMISIL Tablets and all other medications away from children. For more information about LAMISIL Tablets and fingernail or toenail fungal infections, talk to your doctor or other healthcare professional.

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NOVARTIS

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April 1997

A Ramsden electrostatic generator is on view in "Franklin and His Friends" at the National Portrait Gallery.

tribution to modern photography.
The Feather Trade and the American Conservation Movement (through August) In recognition of the centenary of the movement, this exhibition (also in virtual form on the NMAH Website) explores the turn-of-the-century fad for feathered hats and its effect on wild bird populations.
Happy Landings—Evel Knieval A new feature in the Road Transportation Hall. The quintessential American daredevil motorcyclist, Knieval defied gravity and credulity as he rode his bike to the heights of international fame in increasingly challenging, thrilling stunts. On view are Knieval's Harley-Davidson motorcycle and other objects related to his career.

NATIONAL AIR AND SPACE MUSEUM

Space Day (May 6) This daylong celebration on the Mall in front of the museum features interactive, hands-on exhibits, a 63-by-30-foot replica of the space shuttle *Discovery* and a four-hour, 11 A.M. to 3 P.M. EDT, Webcast (www.spaceday.com).
And a Star to Steer Her By A planetarium show (fee) and an accompanying exhibition, *GPS: A New Constellation*, explore the history of navigation, from the ancient mariners to the latest satellite technology.

HIRSHHORN MUSEUM & SCULPTURE GARDEN

Directions: Julião Sarmento: Fundamental Accuracy (through June 20) New figurative paintings and sculptures by this Portuguese artist.
The Hirshhorn Collection at 25 In celebration of the Hirshhorn's 25th anniversary, a floor-wide reinstallation, in renovated galleries, of works by Hopper, de Kooning, Giacometti and other modern-art favorites.

NATIONAL POSTAL MUSEUM

Down with the Frauds: Taxation as Consumer Protection (through September 10) A display of more than 25 extremely rare revenue stamps opens in the Rarities Vault.
Mayhem By Mail Explores three categories of crime investigated by U.S. Postal Inspectors. Objects include a reconstructed mail bomb and a tommygun used in a 1923 train robbery.
As Precious as Gold The importance of letters from home during the Alaska/Klondike gold rush.
What's in the Mail for You! High-tech interactive exhibit about the direct mail industry.

ARTHUR M. SACKLER GALLERY

Devi: The Great Goddess (through September 6) The first major exhibition examining India's all-powerful female deity in all her guises. Free public programs of Indian music, dance and film related to the goddess are scheduled throughout the exhibition period.
Puja: Expressions of Hindu Devotion On view are 125 objects for *puja*, an act of personal devotion to a deity.
Behind the Himalayas: Paintings of Mustang (through September 26) Watercolors by Australian architect and artist Robert Powell of the Himalayan region known as Mustang, politically part of Nepal but geographically part of Tibet. (See "Smithsonian Highlights," March 1999.)

FREER GALLERY OF ART

Selections from the Japanese Collection and *The Tea Ceremony in Japan* (through November 28) Objects on display were selected by guest curators from the Urasenke Tradition of Tea, an international organization dedicated to the study of the Japanese tea ceremony.

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NATIONAL PORTRAIT GALLERY

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George and Martha Washington: Portraits from the Presidential Years (through August 8)

Hans Namuth: Portraits (through September 6) Photographs of more than 200 artists, architects, writers and musicians.

Two Goddesses Seated on an Elephant is on display at the Sackler Gallery in "Puja: Expressions of Hindu Devotion."

NATIONAL MUSEUM OF AMERICAN ART

Abbott Thayer: The Nature of Art (through September 6) Paintings and watercolors of winged figures, landscapes and camouflage in nature. (See SMITHSONIAN, April 1999.)

Picturing Old New England: Image and Memory (through August 22)

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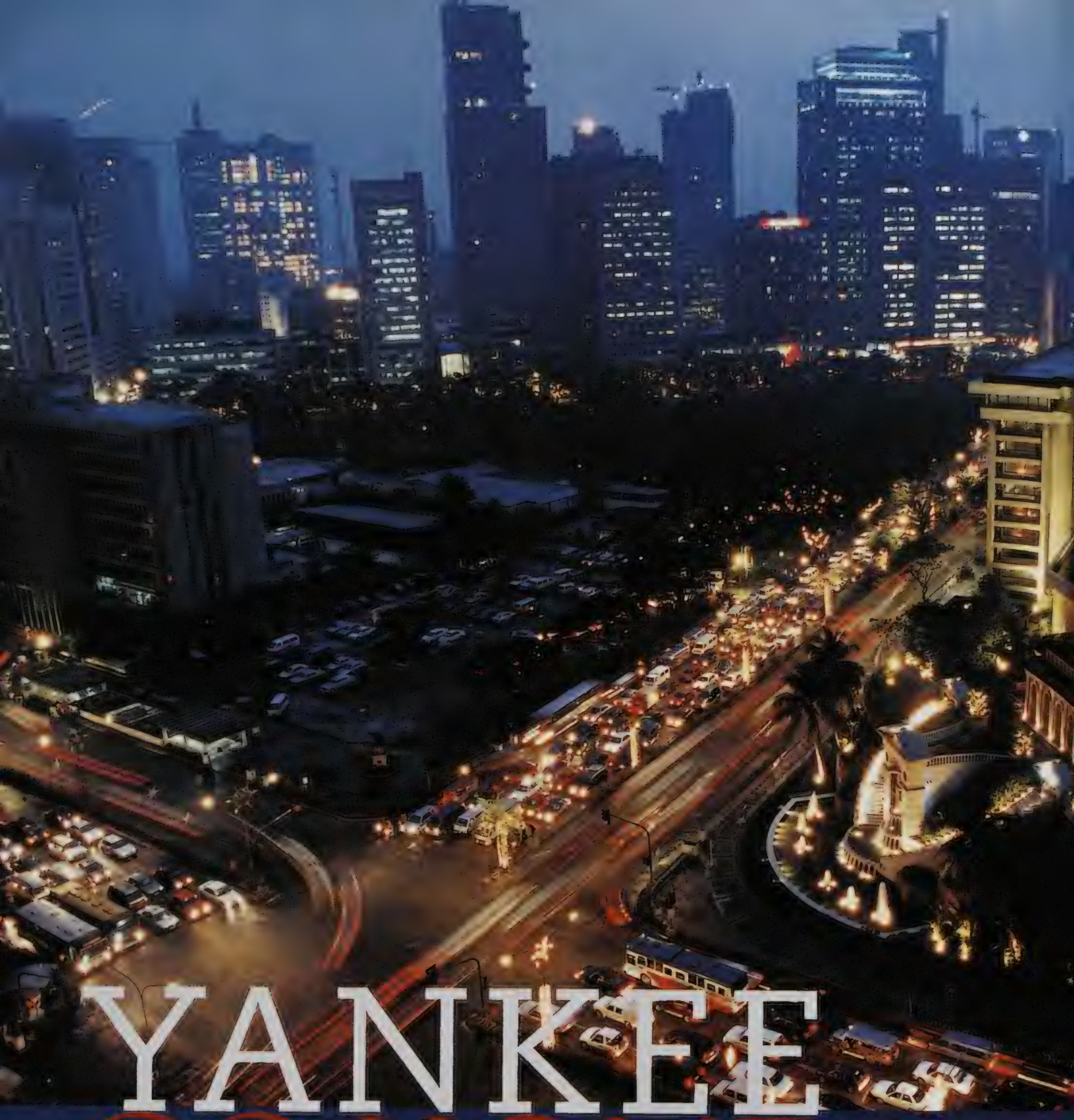
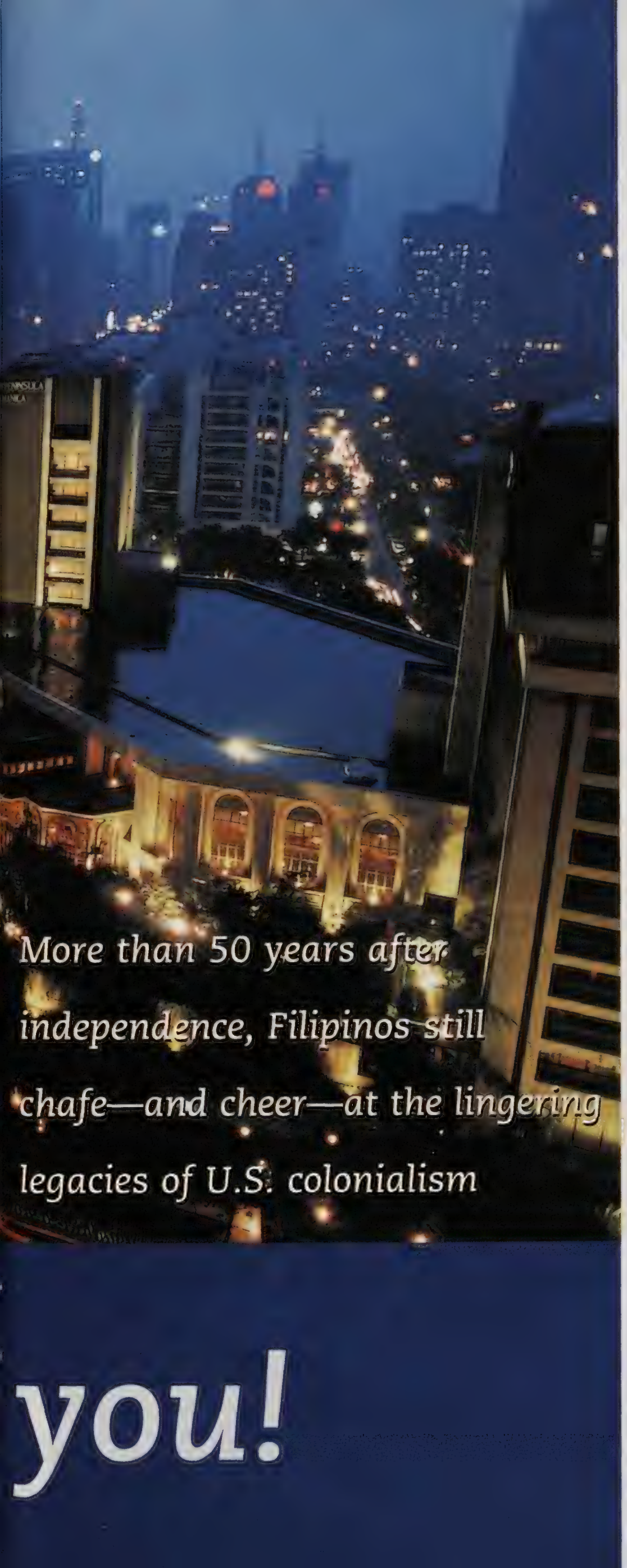


YANKEE GO HOME and take me with

BY EDWIN KIESTER, JR., & SALLY VALENTE KIESTER



THE *THUNK-THUNK-THUNK*, FOLlowed by a *sprunng*! of recoiling metal, was an unmistakably familiar sound. Outside the guest room window Shirts and Skins were tangling in a spirited, take-no-prisoners basketball game as we watched head fakes and no-look passes right out of the NBA play-offs. Except that we were not in Chicago but Cebu, the oldest Spanish city in the Philippines, and the players were all a good foot shorter than Michael Jordan. Size, though, means little in this hoops-mad country, an enduring postscript to the days with Uncle Sam.

The United States brought basketball and a new version of empire to the Philippines a century ago, and only reluctantly lowered the flag at its last military outposts here in 1992. Between times, an extraordinary rela-

Left: The Peninsula Manila hotel, foreground, sits at a crossroads of the glittering Makati district, Manila's high-rise business center. Above: The Philippines' ubiquitous "jeepney" buses trace their descent from WWII jeeps.

JOHN ELK/TONY STONE IMAGES; PP. 40,41 NICOLAS CORNET; P.41 NIK WHEELER

"How can I tell you what I inherited from the Americans? It's woven into every fiber of my being."

tionship grew up between American colonists and colonized Filipinos, constantly veering between affection and irritation. This ambiguous attitude was best summed up by demonstrators' signs during the U.S. Navy's pullout from Subic Bay. "Yankee Go Home—And Take Me With You!"

In the Philippines, Spam is a breakfast treat; the basic form of mass transport is a hybrid called the "jeepney," originally crafted by Filipinos after World War II by mounting a passenger box on a surplus U.S. Army jeep. Jeepneys now come off an assembly line, but their paternity remains unmistakable.

Filipinos like to describe their colonial history, first under Spain, then the United States, as "300 years in a convent followed by 50 years in Hollywood." So here we are, Ed, an American journalist, and Sally, a Philippine-born, Stanford-educated researcher, to try to assess an enduring, often contentious, U.S. legacy.

It is not easy. The Philippine Islands, 7,107 of them, all different and many so small and low-lying that according to a local joke they are "underwater at high tide," are flung like a handful of pebbles into the South China Sea. The main island and northern anchor, Luzon—at about 41,000 square miles it's roughly the size of Kentucky—ranges from teeming Manila to barely explored, heavily forested mountain ranges. Mindanao, the southernmost big island, is home to cultured pearls and pineapples—as well as Muslim mosques. From a ferry slip at one of the relatively tiny Camotes Islands one can see only acres of coconut palms; west of Mindanao, the waters around Palawan offer some of the world's best scuba diving.

The 70 million Filipinos are a mix of Malay, Chinese and Indonesian, with a few Pygmy tribes thrown in, but due to the country's Spanish history, theirs is the only predominantly Christian nation in Asia. They speak eight basic languages of the Malayo-Polynesian family. There are more than 70 regional dialects, each often unintelligible to fellow citizens from other parts of the country.

For Americans, anticolonial rhetoric amply laid on both at home and abroad makes it hard to see the sweet with the bitter side of the colonial relationship. In the past 100 years there have been plenty of disputes, and even violent protests, but the odd Philippine mixture of anticolonialism and pro-Americanism has survived it all. As recently as September 1998, left-wing demonstrators stormed the American Embassy in Manila, throwing red paint representing blood on the embassy's seal. They were protesting a proposed agreement that would allow American warships to dock at Philippine ports. First though, they had to wade through crowds of countrymen in the embassy forecourt, where the line waiting for immigrant visas to the United States begins forming before daybreak.

"How can I tell you what I inherited from the Americans?" asked our friend Peachy Pelaez. "It's woven into every fiber of my being." Peachy's given name is Maria Elena, but like virtually every other Filipino, from President Joseph Ejercito "Erap" Estrada on down, she is known by a nickname.

America came to the Philippines in 1898 in the person of Commodore George Dewey, whose famous command at Manila Bay, "You may fire when you are ready, Gridley," demolished the antiquated Spanish fleet in a few hours (SMITHSONIAN, March 1992). The battle was a sideshow to the war between the United States and Spain over Cuba. Like the Cubans, Filipinos had risen in revolt against Spain, and the Americans began negotiations with the local revolutionaries. An American ship brought revolutionary leader Emilio Aguinaldo back to the Philippines from exile in Hong Kong; the United States also sold him thousands of rifles for use against the Spanish. General Aguinaldo declared Philippine independence on June 12, 1898.

Gripped by an imperialist impulse, the United States dropped all pretense of support for the new indigenous government, signed the Treaty of Paris with Spain and took over the whole archipelago for a fire-sale price of $20 million. Filipinos were outraged; a bloody conflict broke out early in 1899. American history calls it the Philippine Insurrection. It was not an insurrection, say Filipino patriots, but a war between an independent nation and invaders. The United States declared victory in July 1902, but guerrilla action lasted at least another year.

It was a war of atrocities, as we were repeatedly reminded while traveling around the Philippines. On the island of Samar, for instance, Company C of the 9th U.S. Infantry, sent to subdue guerrillas believed to be based in the town of Balangiga, was butchered one Sunday morning in 1901. At a signal from church bells, on the day of a mass ordered by the American commander for recently assassinated President William McKinley, Filipino guerrillas dressed as women in mourning grabbed bolos (large machete-like knives) hidden in coffins and fell upon the unsuspecting troops. Only 20 of 74 survived; most of the

The rice terraces at Banaue, in Luzon's Ifugao Province, are called by some "the eighth wonder of the world." Farmers began carving the paddies out of mountainsides around 1000 B.C.

Above: On the island of Negros, the "farmer's friend," a carabao, or water buffalo, provides motive power for a cartload of sugarcane. Left: Filipinos love basketball, whether pickup or professional. Top left: A country-western group called Foggy Mountain performs at the Wild West Club in Baguio, on Luzon.

slain were literally hacked to pieces. In retaliation, Brig. Gen. Jacob W. "Hell-Roaring Jake" Smith sent in more troops, with orders permitting the killing of any islander over 10 years old and deemed "capable of bearing arms . . . against the U.S." Many were killed.

Re-nicknamed "Howling Wilderness," for the condition in which he wanted to leave the region, Smith was later forced to retire after a congressional investigation. The incident is very much alive in Philippine memory. The avenging Americans burned the village church and seized the bells. The bells are kept today at F. E. Warren Air Force Base in Cheyenne, Wyoming, and as a let-bygones-be-bygones gesture the Philippines has asked for their return. Wyoming veterans' groups have resisted; it will take an act of Congress to send the bells back.

In America, once a colony itself, "anti-imperialists" raged at news of the seemingly endless bloodshed and brutality as the rebellion wore on. "I am opposed to having the eagle put its talons on any other land," declared Mark Twain, a vocal member of the Anti-Imperialist League. American "imperialists," on the other hand, cited America's God-given mission to bring Filipinos the benefits of freedom and democracy.

Despite barracks lyrics suggesting the United States "civilize 'em with a Krag" (from the U.S. Army's recently adopted .30-caliber Krag-Jorgensen service rifle), once annexation was completed the somewhat shamefaced imperialists were anything but harsh. Judge William Howard Taft, later President and Chief Justice, was named the colony's commissioner. The U.S. Bill of Rights was extended to the Filipino people. By 1916 the Philippines had a Filipino-dominated senate and house of representatives. In 1935 the Philippines received quasi-independent commonwealth status and elected Manuel Quezon as its president. Full independence was promised within ten years.

World War II delayed that. But ironically, the ordeal brought the Filipino people and Americans closer together, forging bonds in blood at places like Bataan and Corregidor. American and Filipino soldiers fought shoulder to shoulder against the Japanese invaders, presenting the Imperial Japanese Army with its first sustained resistance, and suffering together in bitter defeat. The memory of that sacrifice is still green. The Japanese were finally driven out in 1945, after savage battles that left Manila one of World War II's most devastated cities. Full independence came to the shattered country on July 4, 1946.

NICOLAS CORNET; PAUL SOUDERS/TONY STONE IMAGES; MIKE YAMASHITA/ WOODFIN CAMP & ASSOCIATES

Their students memorized Lincoln's Gettysburg Address and sang the "Battle Hymn of the Republic."

Or did it? Filipinos point out that Uncle Sam reserved special economic privileges for himself and, the critics say, went right on exploiting the country. As many see it, the Philippines' most popular president, Ramón Magsaysay, was simply a Cold War Yankee puppet. Right after World War II, the Communist-led Hukbalahap Rebellion, which had flared up periodically for years in protest against large landholders, inflamed the Luzon countryside. Magsaysay eventually put it down with help from the U.S. military and the Central Intelligence Agency, and a shrewd sense of popular appeal. Magsaysay had negotiated a peace with the Huk leader when the president was killed in a plane crash in 1957.

The Vietnam War renewed irritation. The Philippines was used as a major U.S. military staging area, setting off anti-U.S. riots. Ferdinand Marcos was elected president in 1965, and reelected in 1969, and he declared martial law in 1972, partly as a response, he said, to the riots. He and his eccentric, shoe-collecting wife, Imelda, ruled the country for 14 more years. When Marcos was brought down by the "People Power" protest rallies in 1986—to Filipinos, the nation's finest hour—the First Couple refused to leave office until U.S. Senator Paul Laxalt, speaking for President Ronald Reagan, told Marcos it was time to go.

Every Filipino knows the history. But there is another side to the story. America's greatest and most lasting contribution was the Philippines' system of free, universal education. Americans founded and funded the nation's premier institution of higher learning, the University of the Philippines. "Unlike the Spanish," a 17-year-old high school senior, Kathy Laine Inso, told us, "the Americans wanted *everybody* to be educated."

That all started in 1898, when the U.S. military began to set up schools for the Filipinos. Civilian teachers began to arrive, and in 1901, decades before the Peace Corps was thought of, 540 idealistic young Americans boarded the U.S. Army transport *Thomas* in San Francisco bound for the Philippines. These "Thomasites" founded schools throughout the islands, many moving in with students' families. "The Spanish came carrying the Cross," says Filipino novelist, publisher and social critic Francisco "Frankie" Sionil José. "The Americans marched behind the symbol of their secular religion—the schoolbook."

Thomasites taught from the Baldwin Reader and other books used at home. Their students memorized Lincoln's Gettysburg Address and sang the "Battle Hymn of the Republic." The process still leads to facetious comment. "Thanks to my American education, I know the capitals of North and South Dakota," said Christian Monsod, former chairman of the Philippines election commission.

Knowing no Philippine languages or dialects, the Americans taught in English, beginning in the first grade. Colonial policy maintained that mandatory English instruction would provide a common language, unifying the widely diverse country and providing English speakers for the burgeoning civil service.

After independence, nationalist fervor rejected compulsory English instruction in favor of the national language, Pilipino, which is based on Tagalog, a tongue spoken by the population around Manila. A leading exponent of this policy, political scientist and former University of the Philippines president José "Pepe" Abueva, claims English is a mixed legacy. "Making us think and express ourselves in a language other than our own," Abueva explained, "stunted our development. It is one reason we are still struggling as a nation." Today more than half of all Filipinos speak English, and even when not doing so, drop English words into a patois nicknamed "Taglish."

If you want to spend a lively evening in the Philippines, just bring up the question of English. One night we had dinner at an elegant Manila home. Over brandy and coffee, we quoted a scholar's comment that "if English is phased out, we will become less dependent as a people."

"Absolute rot!" Winnie Monsod, our hostess, an economist, hooted. "Less dependent? Less dependent on what? In this day of globalization, English is becoming the world language. The Indonesians are scrambling to learn English. The Thais are scrambling to learn English. They are even recruiting Filipinos to teach English. We have this advantage and we're going to give it up?"

But, we said, others argue that teaching English indoctrinates Filipinos with American values and ideas. "Well, what's wrong with that?" our hostess said. "They helped build the country."

It remained for pro-American senior statesman Emmanuel Pelaez, former Philippines vice president and ambassador to the United States, to pronounce the final word on the English-language question. "English was the means through which we internalized the idea of constitutional government and democratic rights," he said. "How would you translate 'due process of law' into Tagalog?"

American public sanitation virtually conquered the periodic cholera epidemics, one of which had killed Sally's grandparents in their early 20s. We asked Eufronio Pungayan, a faculty member at Saint Louis University in Baguio and a descendant of head-hunting mountain tribes, to name the greatest gift America had bestowed on the

Now enshrined in bronze (below), Gen. Douglas MacArthur's triumphant return to the Philippines on October 20, 1944, marked the beginning of a ten-month battle to oust Japanese occupation troops. Savage fighting left Manila in ruins (above).

mountain areas. Without hesitation he replied, "The pit privy."

One night we drifted into a Manila karaoke bar. A young Filipino, reed-slim like Ol' Blue Eyes himself, was warbling "My Way." In the Philippines, it is said, children learn to dance before they can walk and to sing before they can talk, but their performances have a distinctly American beat. Filipino novelists who for decades wrote in English are beginning to write in Pilipino, but the American influence is obvious. Indeed, a Filipino artist of whatever kind still hasn't made it until he or she is recognized in the United States. "Lea Salonga was a nobody until she hit Broadway," a friend told us, mentioning the Filipina star of *Miss Saigon*.

On June 30, 1998, Joseph Ejercito Estrada was inaugurated as the Philippines' 13th president, amid what Filipinos love best—a fiesta. We watched floats, marching bands, and dancers and actors depicting moments from Philippine history parade down the sweltering boulevards of Malolos, where Emilio Aguinaldo had organized the first Philippine republic nearly a century earlier. More impressive, though, was the presence of Estrada's predecessors, Fidel Ramos and Corazon "Cory" Aquino, testifying to the triumph of democracy and the peaceful transfer of power.

General Ramos served as armed forces chief of staff under Aquino and succeeded her in 1992. He quickly pushed through policies that increased export and national growth rates more than 6 percent. The average Filipino knows him better as the president who did away with electrical brownouts and made the phone system work.

A West Pointer with a master's degree in civil engineering from the University of Illinois, Ramos greeted us in his new post-presidential office. "The legacy of America?" he repeated. "We were the first republic in Asia. And you taught us that everyone can join the mainstream of civil society." Almost alone in Asia, Ramos has been a staunch champion of Western-style democracy. Lee Kuan Yew, the Singapore strongman, publicly lectured him about it, maintaining that too much individual freedom had prevented the Philippines from prospering like other Asian "tigers." Referring to the Marcos years, Ramos re-

sponded, "With all due respect, Sir, we tried it your way."

Over our morning mango in our Manila hotel, we had a choice of eight daily English-language newspapers—each more strident than the last. Americans also bequeathed to the country freedom of the press, producing what may be the shrillest newspapers in the world. They serve up a daily diet of exposé, gossip, scandal-mongering and accusatory political comment.

"Our models were American journalists, with their confrontational style," said Gil Santos, a former *Time* correspondent and more recently publisher of the Philippine *Journal*. "They weren't afraid to stand up and question government leaders. In the Philippine-American War, the American journalists disclosed the atrocities against Filipinos, and brought on the congressional investigations."

In the prewar days, American social life centered around the Army and Navy Club and the Manila Polo Club—both off-limits to Filipinos. Gen. Douglas MacArthur, when he retired as U.S. Chief of Staff in 1935 to become field marshal in charge of organizing the Philippine Army, occupied a seven-room penthouse in the majestic Manila Hotel. After a few steamy summers in Manila, the perspiring American imperialists sought refuge in mile-high Baguio, set among fragrant pine forests, with a military recreation center and golf course called Camp John Hay.

Came December 1941, and swift disaster. By January 1942 Japanese troops had taken Manila. Americans and Filipinos fell back into the Bataan Peninsula and the island fortress of Corregidor, but on April 9 the American Maj. Gen. Edward King surrendered to the Japanese, his bottled-up force already decimated by hunger, malaria, dysentery and beriberi. In early May, Corregidor and the rest of the American and Philippine army gave up, too.

Filipino bitterness against the Japanese still bubbles to the surface. One morning Alfred Xerez-Burgos, a 76-year-old retired colonel and Bataan veteran, took me by hydrofoil to Corregidor. The tadpole-shaped "Rock" in Manila Bay has become a leading tourist attraction, featuring a sound-and-light show depicting the 1942 siege. Japanese tourists make up a large percentage of visitors.

Our English-speaking guide began by describing the 30 days and nights of fighting that devastated Manila in 1945. "More than 100,000 Filipino men, women and children were killed by the Japanese during those 30 days," he declared, fixing the Japanese with a steely gaze.

In the infamous "Death March," the Japanese captors drove 70,000 ragged, sickly prisoners at bayonet point 55 miles from the southern end of Bataan to San Fernando in 100-degree heat, without clean water, food or stops to rest. Thousands were then jammed into boxcars. More than 2,000 Americans and uncounted Filipinos died of such treatment. Not only the military suffered. The Japanese herded thousands of American civilians into squalid internment camps such as the one at Manila's University of Santo Tomás. Others fled to the hills to join a highly effective guerrilla campaign composed of Filipino and American soldiers who had refused to surrender. Still other civilians, including 4-year-old Sally and her mother, simply hid out, nurtured by friends.

On October 20, 1944, General MacArthur triumphantly waded ashore on Leyte, at Red Beach. "I have returned!" he declared, and thus fulfilled the promise he had made when he escaped to Australia in 1942. For ten months, Americans and Filipinos liberated the archipelago, island by island, from Japan's 300,000-man army of occupation.

MacArthur's arrival is still regarded as a great moment in Philippine history. The classic photograph showing him in the surf with Philippine president Sergio Osmeña has been reproduced in a larger-than-life bronze sculpture on Leyte, the MacArthur Landing Memorial. MacArthur's rep-

Marines lowered the American Flag for the last time at historic Subic Bay Naval Base on November 24, 1992.

RICHARD VOGEL/GAMMA LIAISON

Above: The Philippine Military Academy, in Baguio City, trains future officers for all of the Philippines' armed services. Below: Students in a crowded Baguio City high school classroom no longer study an Americanized curriculum.

utation is greatly diminished in America. But in the Philippines, a nation whose people tend to focus on personalities, he is the ultimate hero.

Much of the Philippines can still be caricatured as a backward land with more than half the population living in small villages. Yet a great deal of the country is urbanizing. Manila and Cebu lead the way with predictable woes about horrendous traffic, garbage heaps and unbreathable air. The gleaming skyline of Makati, Manila's financial district, has the look of a Houston or Phoenix. Giant, bustling megamalls sell Guess jeans and Nike sneakers. Shoppers carrying cellular phones sip Starbucks coffee or hang out at the Hard Rock Cafe. The stifling humidity has been overcome by pervasive air-conditioning. Once the country's primary products were sugar, coconuts and timber. Today 51 percent of export income derives from electronic equipment and components.

Prosperity is predictably uneven. In 1994 the number of Filipino families living in poverty was 35.5 percent; in 1997 it was down to 32.1 percent. That is still not an inconsiderable percentage, especially given the extreme contrast between rich and poor. "When the Americans came, the country was ruled by an elite," Frankie José says. "When they left it was governed by that same elite and it is still."

Political corruption, Filipinos grant, is endemic, and Yankee influence gets blamed for it. By creating a civil service and arranging for its "Filipinization," the rather tor-

tured logic goes, Americans opened the way for bribery and nepotism. With their strong family ties, and no civil service tradition, Filipino administrators handed out jobs to the folks they knew best. "Americans taught us the idea of honesty and integrity in civil service," political scientist Abueva says with remarkable candor, "but our local culture conflicts with the democratic model."

A four-hour drive from Manila, overlooking the South China Sea, lies the former American naval base at Subic Bay. During the Vietnam War, Subic was the major logistical support center in the Western Pacific. Today nine Federal Express planes a day arrive and depart from what is now the free port of Subic, making it the firm's main

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The Philippines Stock Exchange Building in Manila's Makati district reflects the country's efforts to promote a high-tech future.

transshipment point in Asia. New buildings are occupied by computer firms like the Taiwanese Acer International.

American military bases have always been a hot issue. During the Cold War, Subic Bay and Clark Air Base were crucial to the U.S. position in the far Pacific—and an important part of the Philippine economy. Including the bar girls in Subic's neighbor Olongapo, a.k.a. "Sin City," more than 40,000 Filipinos were provided with jobs, directly or indirectly, by the bases. Nationalists hotly denounced U.S. bases as violations of Philippine sovereignty. When the renewal of the Subic Bay lease came up during the Aquino administration (the United States had abandoned Clark Air Base when Mount Pinatubo buried it), it was denied in the Philippine senate by a vote of 12-11.

Subic's post-American success can be largely credited to Richard Gordon, the mayor, when the bases closed, of Olongapo City, adjoining Subic. Until then he had been pro-base, because base employees made up most of his electoral support. Now he popularized a "free port" proposal that allowed foreign firms to import unfinished materials tax and duty free, then assemble and export them. The World Bank loaned $100 million. The U.S. Navy left behind more than $1.3 billion in equipment and facilities.

Some 100,000 Americans remain in the Philippines, many of them retired servicemen who stayed on. The American Embassy in Manila is the only U.S. diplomatic post overseas that houses a Veterans Affairs office.

On July 4, 1998, the American colony celebrated U.S. Independence Day (once also Philippine Independence Day, now renamed Philippine-American Friendship Day) in the embassy residential compound, its facilities a throwback to more glamorous days.

The festivities, with plenty of sodas and hamburgers, could have occurred in any town in America. Children, their faces painted red, white and blue, waved miniature American flags and tramped along behind a Philippine Marine band blasting out "This Land Is Your Land." As a finale, fireworks created an American flag against the backdrop of Manila Bay, one of the few times we saw the Stars and Stripes in a land where it once waved everywhere.

The next evening at dusk, outside the Manila Hotel we watched the hotel staff lower the Philippine flag. One at each end, they folded it in lengthwise fourths, then into triangles. It was a ritual familiar to every American Boy Scout who ever passed the Tenderfoot American flag requirements. Unknown perhaps to the young men folding it half a world away, the triangles, of course, represent the tricorn hat, symbol of the American Revolution. One more American touch adopted without question into the lasting fabric of the Philippines.

Edwin Kiester, Jr., wrote about air traffic management in the October 1998 SMITHSONIAN. *Sally Valente Kiester, Philippine-born, is an educator and writer based in California.*

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INFECTIONS

seeking

TEMPTRESS OR ICON OF INNOCENCE, CULT FIGURE

MONA

OR CULTURAL ARCHETYPE, LEONARDO'S MYSTERIOUS

LISA

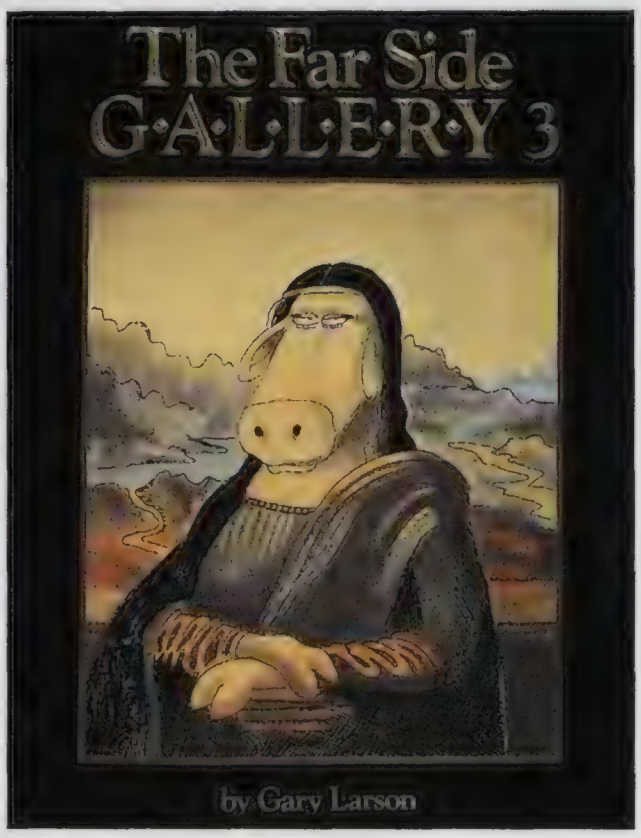
MADONNA HAS INTRIGUED US FOR 500 YEARS

The famous face, transmogrified into a marketing tool, has been applied to products as various as liquor, bonbons, socks—and even a clock.

BY JOSEPH A. HARRISS

GOING WITH THE FLOW, I FOLLOW THE BODY HEAT FROM THE CAVERNOUS CRYPT BENEATH the Louvre's glass pyramid up past a dying Italian slave and a nude Greek warrior, a diminutive French general directing troops and a carelessly draped lady with wings. On the second floor, in a room where you could comfortably play tennis, the background murmur grows to a clamor and the air, on this warm August day, is distinctly ripe. Harried tour leaders waving striped sticks or colorful scarves try to corral their polyglot charges. But most of them are busy jockeying and elbowing to get as close as they can to a bullet-proof, air-conditioned showcase for a glimpse of Leonardo da Vinci's 500-year-old portrait of a preternaturally poised Florentine lady.

Largely ignoring the room's other masterpieces of Italian classical painting, its splendid Tintorettos, Veroneses and Titians, the throng aims high-performance cameras at the showcase and lets fly a fusillade of flashes, pinpoints of light bouncing back from its window. Many stand beside it to be photographed, as if they were in front of the Eiffel Tower. It all reminds me of when, as a young reporter, I occasionally had to cover chaotic, shoving, celebrity press conferences. Except here the superstar says nothing. She merely gazes back with a cool, appraising smile.



The *Mona Lisa* is the most famous work in the entire 40,000-year history of the visual arts. And if you don't agree with that, your argument is not with me but with the respected art historian Roy McMullen, who has studied the phenomenon extensively. "It provokes instant shocks of recognition on every continent from Asia to America," he observes, "reduces the Venus of Milo and the Sistine Chapel to the level of merely local marvels, sells as many postcards as a tropical resort, and stimulates as many amateur detectives as an unsolved international murder mystery." Like many celebrities, the *Mona Lisa* today is famous for being famous. Louvre officials estimate that most of the museum's first-time visitors come mainly to stare at this cross between a cultural archetype and an icon of kitsch. Undoubtedly, the painting has become part of our collective subconscious. What they are looking for is the picture that has provoked—and been the object of—more crazy reactions, addled adulation, arcane analysis, gross imitations, scandalous takeoffs and crass commercialization than any other work of art in history.

The painting's status as a world-class superstar was confirmed beyond any doubt when, in 1963, the French Minister of Culture, André Malraux—who called the painting "the most subtle homage that genius has ever rendered to a living face"—sent it to the United States and, a decade later, to Japan as a sort of itinerant ambassador of French culture, its Italian origins notwithstanding. On arriving in America in January 1963, in its own cabin aboard the SS *France*, the *Mona Lisa* was received more like a potentate than a painting. A tuxedoed President John F. Kennedy and an evening-gowned Jacqueline Kennedy formally welcomed it to Washington's National Gallery of Art, where the director, John Walker, hailed it as "the most famous single work of art ever to cross the ocean." White-gloved U.S. marines guarded the painting around the clock. Even though the museum was kept open evenings for the first time in its history, crowds waited for up to two hours to get a look at the famous face; one man asked a guard, in passing, what the grand building was used for when the *Mona Lisa* wasn't there. It was the same mob scene in February and March at New York's Metropolitan Museum of Art, with lines down Fifth Avenue for blocks in severe winter weather. In all, more than two million Americans ogled the *Mona Lisa*.

But Mona mania in America paled beside the frenzy in Japan, to the hand-wringing despair of some French aesthetes who complained that the work was being exhibited like Brigitte Bardot or a Folies Bergère *danseuse*. When the *Mona Lisa* arrived at Tokyo's National Museum in April

Recent send-ups include Gary Larson's bovine madonna (above), Monica Lewinsky as Mona, and Miss Piggy as *Mona Moi*.

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many an artist has tried to equal it as a sort of ultimate challenge, the Everest of oil painting. One, the French artist Luc Maspero, threw himself from the fourth-floor window of his Paris hotel in the mid-19th century, leaving a farewell note: "For years I have grappled desperately with her smile. I prefer to die."

Even when not inducing a death wish, the smile has often generated perplexity. Is it "more divine than human," as a 16th-century Italian writer had it, or "worldly, watchful and self-satisfied," according to British art historian Kenneth Clark? The 19th-century French Positivist thinker Hippolyte Taine seemed unable to make up his mind, variously calling it "doubting, licentious, Epicurean, deliciously tender, ardent, sad," while novelist Lawrence Durrell puckishly dubbed it "the smile of a woman who has just eaten her husband." Feminist Camille Paglia went further: "What Mona Lisa is ultimately saying is that males are unnecessary," she opined. Salvador Dalí, ever provocative, even attributed the 1956 attack on the painting, when a young Bolivian threw a rock that put a small scar on the left elbow, to the smile. "Subconsciously in love with his mother, ravaged by the Oedipus complex," Dalí theorized, the young man was "stupefied to discover a portrait of his own mother, transfigured by the maximum female idealization. His own mother, here! And worse, his mother smiles ambiguously at him. . . . Attack is his one possible response to such a smile."

In our less poetic age, the trend has been more to physiological explanations for the smile. Was Mona Lisa, who-

A 19th-century critic called her "doubting, licentious, Epicurean, ardent, sad."

1974, visitors totaling 1.5 million thronged the building and were hustled past the painting for a ten-second look. A uniformed guard atop a podium directed the traffic. Outside, the hype approached hysteria. Dozens of bars and nightclubs changed their names to Mona Lisa, one staging a Mona Lisa Nude Revue. A telephone number yielded a recording of the lady saying, in Italian, how happy she was to be in Japan. Japanese girls wore décolleté dark dresses with long sleeves, and parted their hair in the middle; some even resorted to plastic surgery in order to produce a more convincing Lisa Look.

The look that inspires such bizarre behavior is defined by the enigmatic, tight-lipped smile that has launched a thousand learned interpretations, lucid explanations—and loony analyses. Renowned art critic Bernard Berenson set the tone for serious appreciation when he proclaimed that Leonardo's subtle sfumato technique of modeling light and shade reached its apex with the *Mona Lisa*. For centuries ever she was, asthmatic? Simply a contented pregnant housewife? Some researchers have concluded that she probably smiled with her mouth closed because she was undergoing 16th-century-style mercury treatment for syphilis; the mercury would have turned her teeth an ugly black, and left her with a sorely inflamed mouth. A Danish doctor found that the model had congenital palsy affecting the left side of her face, backing up his theory by pointing out that she had the typically large hands of such patients. After due study, an ortho-

pedic surgeon in Lyons, France, decided that Mona Lisa's semi-smile resulted from her being half-paralyzed either from birth or as the result of a stroke; one indication of this, he argued, was that her right hand looks relaxed but her left hand is strangely tense.

But more intriguing than why the model is smiling is the mystery of exactly *who* is doing the smiling. An early reference to a woman named Lisa comes from the 16th-century Italian art historian Giorgio Vasari—who himself never actually saw the painting. Writing around 1550, a good 40 years after the work was supposed to have been completed, Vasari says: "Leonardo undertook to paint for Francesco del Giocondo a portrait of Monna [a variation of *mona* or *madonna,* "lady"] Lisa his wife." Historians know that a Lisa Gherardini of Florence was married in 1495, at the age of 16, to Francesco di Bartolommeo di Zanobi del Giocondo, a 35-year-old Florentine official already twice a widower. But there's no evidence at all that del Giocondo commissioned the portrait from Leonardo, no sign he paid the artist and, most important, no sign the painting was delivered to him, since Leonardo kept it with him until his death in Amboise, France, in 1519. Nor does Leonardo mention the project anywhere in his voluminous notebooks.

So art historians have had a field day trying to guess whose portrait it is. Some plump for Isabella d'Este, who knew Leonardo well in Milan and whose portrait he did in crayon, perhaps as a study for an oil painting. Others hold for Costanza d'Avalos, duchess of Francaville, who is mentioned in a contemporary poem as having been painted in mourning by Leonardo "under the lovely black veil." There's even speculation that a second portrait of Mona Lisa may have existed. That painting may have been commissioned by one Guiliano de' Medici—perhaps because he was so taken with the original portrait that he requested one for himself. Evidence exists that he asked Leonardo to paint her, leading to the intriguing possibility that the artist did two *Mona Lisas*, one for her husband, Francesco, and one for Giuliano, who may have been her lover. Now there's something to smile secretly about.

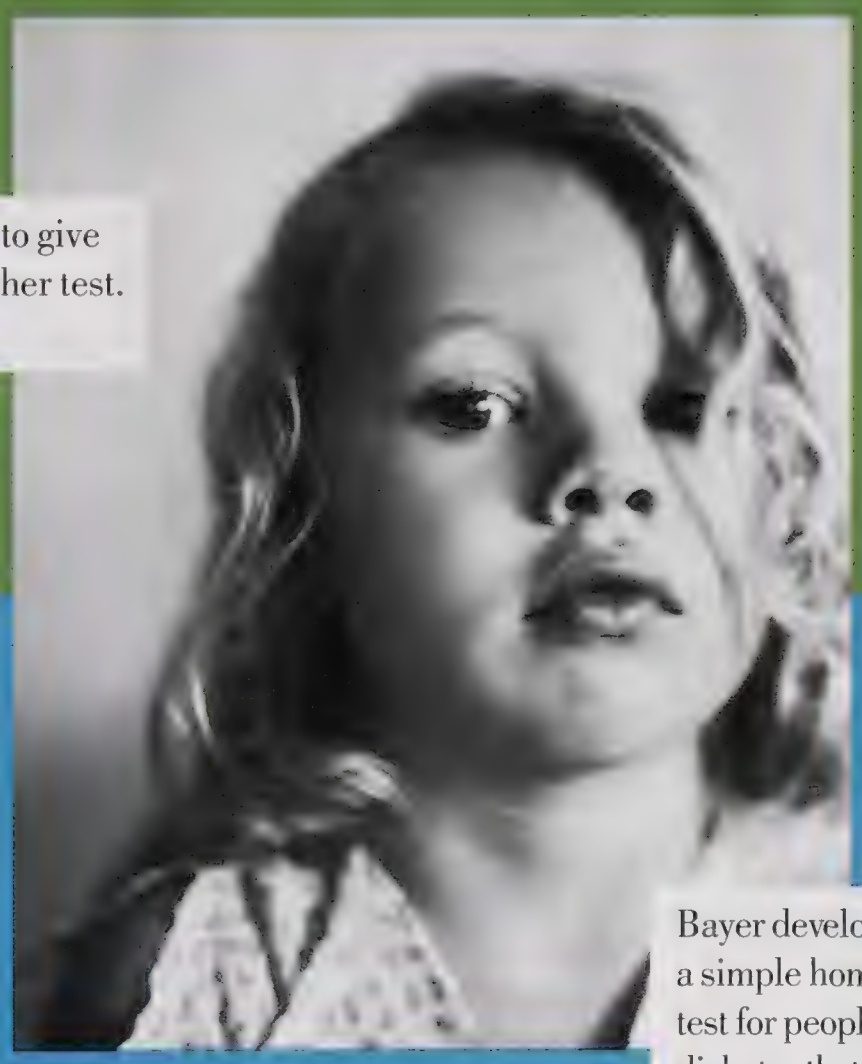
Then there's the high-tech approach. Lillian Schwartz, a computer graphics consultant at the Lucent Technologies Bell Labs in New Jersey, has applied computer-based techniques to the mystery. After reversing Leonardo's self-portrait so the artist is facing to the left, then scaling the image and juxtaposing it with the *Mona Lisa* (whose subject also faces left) on the computer screen, Schwartz found that the noses, mouths, foreheads, cheekbones, eyes and brows all line up. Conclusion: Leonardo started with an earlier portrait of a woman, then, finding himself without the sitter, used himself as the model—sans beard. She ties it all together with the knotted patterns, resembling basketwork, on the bodice of Mona Lisa's dress. Noting that Leonardo, like many Renaissance poets and artists, loved riddles and puns, she makes the connection between his name, Vinci, and *vinco*, the Italian word for the osier branches used in basketry. Voilà, the case is made. "That famous smile, so tantalizing for so many centuries, is the mirrored smile of da Vinci himself," she says confidently.

Art historians have had a field day trying to guess whose portrait it is.

Not everyone is convinced. But the possibility of a pun lying at the heart of Leonardo's mystery painting is taken seriously at the Louvre. Giocondo, Lisa Gherardini's mar-

Andy Warhol's silkscreen (1963) pays homage to a visage already famous for rather more than 15 minutes.

ASK THIS diabetes patient to give even more blood for yet another test. Go ahead, ask her.



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French painter Jean Ache has rendered the portrait in the style of artists including (clockwise, from top left) Gauguin, Picasso, Modigliani and Léger.

more than a realistic portrait, the idea of a smile expressed in the form of a painting."

For at least the past 150 years, appreciation of the *Mona Lisa* has veered back and forth between awed Giocondolatry and burlesque Giocondoclasm. The overwrought school of heated, romantic interpretation might have begun, oddly enough, with the Marquis de Sade, who found Mona Lisa full of "seduction and devoted tenderness," and "the very essence of femininity," though given his tastes one wonders exactly what he meant. A bit later the great French historian Jules Michelet admitted, "This painting attracts me, calls me, invades me, absorbs me; I go to it in spite of myself, as the bird goes to the serpent."

The idea of Mona Lisa as femme fatale was launched. Walter Pater, leader of the 19th-century English Aestheticism movement and ardent advocate of art for art's sake, followed up turgidly. "She is older than the rocks among which she sits," he swooned; "like the vampire, she has been dead many times, and learned the secrets of the grave." Not only that; for him this exotic beauty expressed "the animalism of Greece, the lust of Rome, the mysticism of the middle age . . . the return of the Pagan world, the sins of the Borgias." Pater seemed badly in need of a cold shower, as was the French writer of the same period, Arsène Houssaye, who called her "treacherously and deliciously a woman, with six thousand years of experience, a virgin with an angelic brow who knows more than all the knowing rakes of Boccaccio."

Sigmund Freud, too, pulled out all the stops when trying to figure out the "beautiful Florentine lady." Neatly pigeonholing Leonardo as an obsessive neurotic in his book-length study *Leonardo da Vinci, A Study in Psychosexuality*, Freud decided that Mona Lisa's expression must

ried name, means, in Italian, cheerful, merry, joyous, as does "jocund" in English. (A variant of the word supplies the French title for the painting, *La Joconde*). Leonardo had already played with a sitter's name by incorporating a

"This painting attracts me, calls me, invades me; I go to it in spite of myself."

juniper bush in his portrait of Ginevra (similar to "juniper," *ginepro* in Italian) de' Benci that hangs in the National Gallery of Art. "He was punning on Mona Lisa's married name when he gave her a subtle smile in *La Joconde*," says Cécile Scailliérez, curator of 16th-century French and Italian painting at the Louvre. "He made it emblematic of her. What we really have here is an idea, have resembled the lost, mysterious smile of the artist's mother. As for Mona Lisa herself, he proclaimed her nothing less than "the most perfect representation of the contrasts dominating the love-life of the woman, namely reserve and seduction, most submissive tenderness and the indifferent craving, which confront the man as a strange and consuming sensuality." (On second thought, perhaps

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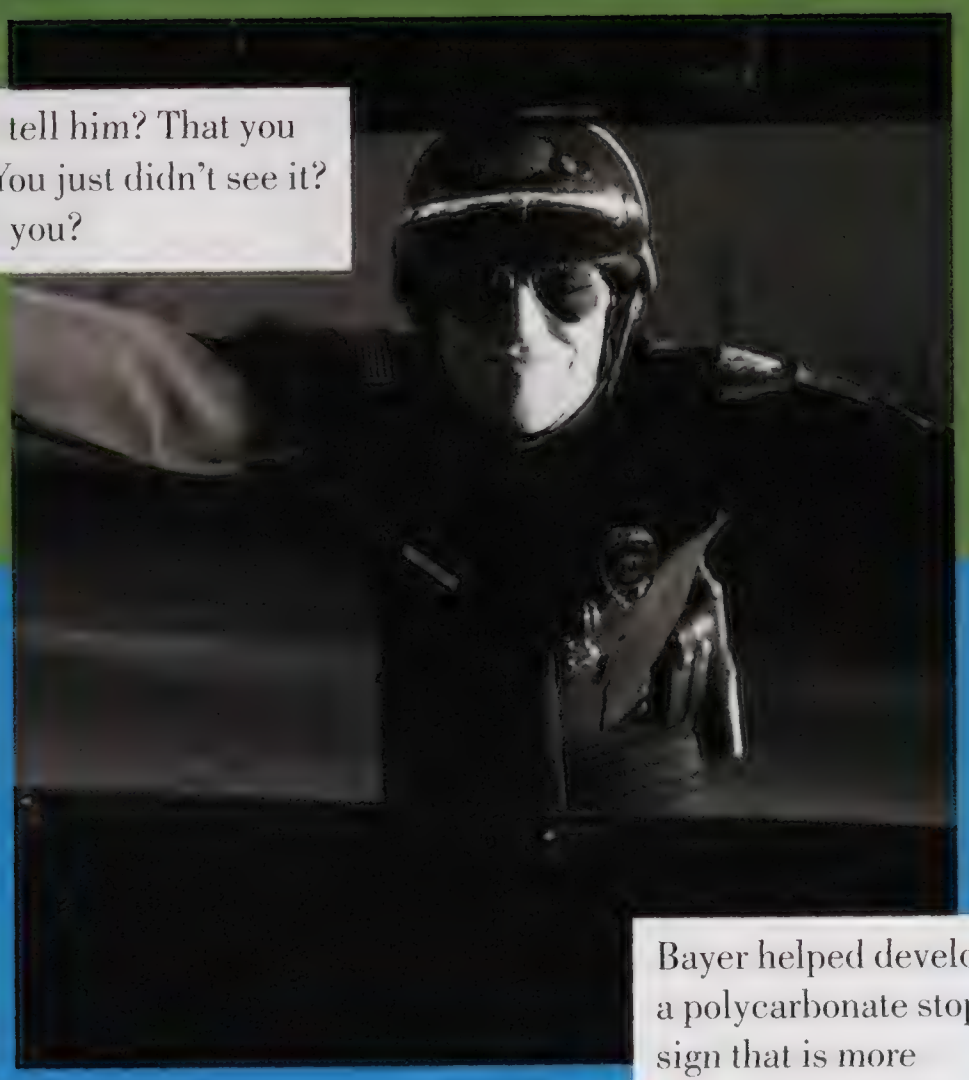

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Premier collector of Monalisabilia, Jean Margat prizes his Giocondo-inspired pince-nez and beaded curtain (background).

we had better not take the kids to the Louvre after all.)

Twentieth-century ideas on art became more down-to-earth—like, how much is it worth? King Francis I added the *Mona Lisa* to France's royal collections for 4,000 gold *écus*, or about $105,000. Today Louvre officials say that the *Mona Lisa*'s monetary value is inestimable. In 1911, however, it was somewhere in between: the painting, though precious, was not yet such a superstar on the world art market that it couldn't be sold. That made it worth stealing.

The biggest art heist in history occurred that year, with Parisians waking up on August 23 to screaming headlines like the one in the daily *Excelsior*: "The Louvre's Joconde Stolen: When? How? Who?" The answers were a long time coming, as an army of French, German, Russian, Greek and Italian detectives went on a merry, futile chase for two years. Then, when the public was becoming resigned to the loss of the *Mona Lisa*, an Italian laborer named Vincenzo Perugia got tired of keeping the original in the false bottom of a trunk.

Perugia, who had worked in the museum, used his knowledge of it to lift the painting. He was put up to it by an Argentine con man named Eduardo de Valfierno, who had a skilled art forger knock off six copies. Valfierno then sold the copies to eager, if unscrupulous, collectors—five in North America, one in Brazil—who thought they were getting the real thing straight from the Louvre. The scam made him the equivalent today of $67 million. When Valfierno didn't claim the original—ironically, he didn't need it for the operation—Perugia naively offered it for sale to a Florence art dealer and was promptly pinched. The *Mona Lisa* returned to France on December 31, 1913, ensconced in a special compartment of the Milan-Paris express. Her retinue included an assortment of policemen, politicians, museum bureaucrats and artists. Incredibly, the painting had suffered no physical damage.

The damage was to the blind veneration and respect in which the portrait had been held for centuries. Somehow the caper and its familiar, irreverent press coverage rubbed off some of the *Mona Lisa*'s mystique. The age of Giocondoclasm had begun.

Even Bernard Berenson admitted a change of heart. "To my amazement," he wrote after the theft was announced, "I found myself saying softly: 'If only it were true!' And when the news was confirmed I heaved a sigh of relief . . . She had simply become an incubus, and I was glad to be rid of her." For this eminent connoisseur of Western art, as surely for many others, all the bowing and scraping over the *Mona Lisa* had become a pain in the neck.

Suddenly the public couldn't get enough of jokey Giocondiana. One postcard showed a grinning, toothy Mona Lisa thumbing her nose at the public and saying, "I'm off to see my Vinci, thanks and good-bye, all you gawkers."

Somehow the caper and its irreverent press coverage rubbed off some mystique.

Another postcard, after the return, showed her holding a baby with Perugia's picture in the background, as if she'd been on a romantic escapade.

With irreverence and reaction against "bourgeois" values the new order of the day, the painting that had been the image of perfect, inaccessible beauty became the ideal target for desperately modern iconoclastic artists, like the Dadaists, who were sick of the very idea of a masterpiece. Marcel Duchamp, unofficial leader of the Dada anti-art movement, summed up the new zeitgeist in 1919 with a few strokes of his brush. Taking a standard postcard reproduction, he brushed in a pointy mustache and goatee

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At the Louvre, videocam-toting tourists, thronged around Leonardo da Vinci's masterpiece, hustle to capture an image of the museum's eternal superstar.

on the sacred face, and added a naughty caption. Now his action looks like no more than a childish prank. But the uptight art establishment, raised on the likes of Pater and the traditions of academic painting, was shocked, *shocked*.

Today the *Mona Lisa* is in the paradoxical situation of being both the symbol of Art and the inspiration for kitsch. Artists vie to see who can do the most outrageous parody; advertising studios labor to come up with the funniest way to use the image to sell everything from aperitifs to airlines, golf clubs to strips that hold your nasal passages open. Collectors of Giocondiana have catalogued nearly 400 advertising uses of the image and counting, along with at least 61 products called Mona Lisa, made in 14 countries.

Want to mock Salvador Dalí's commercialism? Do a montage with his eyes and upraised mustache on Mona Lisa's face, then put his hands overflowing with money in place of hers. Touché! Want to make light of a weighty public figure, from Stalin to De Gaulle to Prince Charles? Caricature him as Mona Lisa. Funn*eee*! The portrait also has become the favorite of computer-age digitizers of images. In Paris, Jean-Pierre Yvaral has done more than 150 synthesized Mona Lisas composed of hundreds of geometric patterns that look abstract up close but become Herself from afar. Next big project: digital images of her on the tails of British Airways jetliners.

Though he's no high-flying art critic or historian, Jean Margat has his own answer to the painting's mythic hold on the imagination. A retired geologist, Margat, from his home near Orléans, France, presides over the Friends of Mona Lisa, a club of serious collectors of Giocondiana, of which Louvre director Pierre Rosenberg is a member, along with a woman in faraway Ann Arbor, Michigan.

Margat and other Friends get together once in a while for a convivial lunch in Paris where they discuss and compare their collections. Margat's takes up a good part of his two-story house and ranges from Mona Lisa T-shirts, posters, ballpoint pens, coffee mugs, drink coasters, condoms, panty hose, clocks, matchbooks and thimbles bearing The Face, to truly rare—and expensive—items like a beaded curtain from Vietnam, a Persian rug and a life-size Mona Lisa sculptured in two kinds of marble that he paid a pretty penny for in Switzerland. His latest enthusiasm is for a bit of kitsch created in Brooklyn and known as the Giggling Mona Lisa Pillow, which squeals with glee when squeezed in the middle. The Friends now are developing an Internet site and hope to advise the planners of a mega-Mona exhibition, tentatively scheduled to open in Paris, to mark the year 2000.

By then the painting may have its own special room at the Louvre, the better to admire it—and keep the crowd away from the other museumgoers—thanks to a $4.1 million grant from a Japanese television network. This biggest-ever act of cultural sponsorship in France leaves Louvre curators with mixed feelings. Already prisoners of the myth, they can't touch the *Mona Lisa* to clean it for fear of media and public outcry, although it's filthy and covered with thick yellowish varnish that would benefit from cleaning. "The new room will be an improvement," says a resigned Cécile Scailliérez, "but unfortunately it will make the *Mona Lisa* even more of a superstar by setting it apart." As for Jean Margat, the project leaves him cold. "Frankly I don't much like that painting," he says with a shrug. "To me it's not expressive and it doesn't look like a real person. But I guess it's timeless, *hélas*."

The painting is both the symbol of Art and the inspiration for kitsch.

Paris-based Joseph A. Harriss, a frequent contributor to SMITHSONIAN, *says he is still trying to elucidate Mona Lisa's enigmatic smile.*

STEVE MUREZ

The mystery of the invisible broker.

{A cautionary tale}

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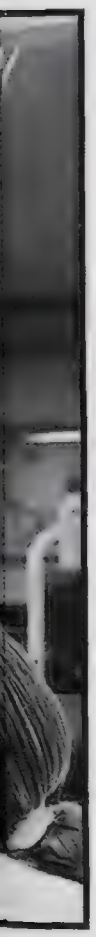

ode!

BY CARL HOFFMAN

IT FEELS AS HOT AS A SAUNA OUT HERE. I am watching Mary Pierce crouch on the tennis court baseline, her feet churning. She's tethered to Mark Verstegen, a muscular guy with rock-steady blue eyes, by an eight-foot bungee cord. "Go Mary! Go! You're smoking, girl!" shouts Verstegen.

She's smoking all right; the rubber soles of her tennis shoes are literally hot to the touch. She is drenched in sweat. Fighting the pull of Verstegen's cord, Pierce accelerates along the baseline to the court's left edge, and just as her left foot is about to set . . . yank! Verstegen jerks the cord. Without missing a step, much less her balance, she plants her foot,

PHOTOGRAPHS BY ALEX QUESADA

Fun and games at IPI (from left): Mark Verstegen looks on as Nomar Garciaparra strains; Garciaparra and George Lombard work on agility; Mary Pierce takes a stretch and a lesson.

swings her racket at an imaginary ball and darts immediately to the center again as fast as she can, even as Verstegen pulls her along. On the way out, she's fighting the cord; on the way back, she's going with the flow. Left, center. Right, center. All the while, her feet go rat-a-tat-tat.

On this day in September, Pierce is ranked 11th in the world in women's professional tennis. Compared with normal people, Verstegen tells me during a break in the action, "she's a genetic freak." But at 23 she's aging fast. She is competing with hundreds of other "freaks" who are younger, maybe even hungrier. And 11th is, after all, still ten places back from number one. In the mega-million-dollar business of professional sports, to the victor go the spoils. Two weeks ago, the U.S. Open cut the winner a $700,000 first-prize check. Pierce lost in the fourth round to a teenager named Venus Williams.

Which is why she's here at the International Performance Institute (IPI) in Bradenton, Florida, trying to goose not just her tennis game but the physiological fundamentals on which it's built. Never mind her backhand. "They can all hit brilliant forehands and backhands," says her coach Michael de Jongh. To win in a world of six-foot-plus teenage girls who've been weaned on high-protein shakes and weight training, she's got to be quicker and more powerful.

USING THE LATEST IDEAS IN SPORTS SCIENCE

VERSTEGEN OPENED IPI IN 1995 AT the Bollettieri Sports Academy, a sprawling, palm-tree-lined campus where 350 young tennis, soccer, baseball and golf prospects from around the world train. Since then, under his direction, it has been using the very latest ideas in sports science to help a growing number of professional and elite amateur athletes reach the pinnacle of their sports. At IPI the trainers don't touch a tennis player's drop shot or try to improve the accuracy of a basketball player's three-point jumper. Instead, applying techniques developed in the intense, body-as-machine worlds of track-and-field and Olympic weightlifting, they improve an athlete's ability to hustle the drop shot or to break open and jump higher to make the three-pointer.

Take Boston Red Sox shortstop Nomar Garciaparra. After his rookie season in the minors, he was exhausted. When he first showed up at IPI, Verstegen examined him as if he were a candidate for a spaceflight program. He investigated Garciaparra's past training history; his injuries; his height, weight and percentage of lean body mass; his diet; his speed over 60 yards; his vertical jump; his lateral speed through a series of traffic cones; and his power output as measured by throwing different sizes of medicine balls. Looking for signs of muscle imbalances, Verstegen watched as Garciaparra performed a series of slow squats and bends holding a broomstick above his head. Did his hips and shoulders move out of alignment (indicating a flexibility problem)? Did his feet rotate internally or externally (indicating imbalances between his inner and outer thigh muscles)? Did he lose his balance?

The tests confirmed what was already obvious: Garciaparra was an unusually well-coordinated athlete. But at a measly 155 pounds, he lacked the power and speed he needed to compete in the big leagues. Garciaparra signed a contract pledging "maximal effort," as all athletes who come to IPI must, and ponied up $1,250 a week, not including room and board. Verstegen outlined a plan to boost his power, speed and endurance.

Improving even a professional athlete's techniques has to be done in a step-by-step process. First, like a track coach working with a sprinter, Verstegen taught Garciaparra how to accelerate forward and sideways from a standstill, and how to change directions, all as efficiently as possible.

Tethered to Verstegen, Pierce repeatedly throws a medicine ball against the wall. Later (left) she strengthens her lower back playing catch with the 6½-pound ball.

Instead of taking two or three steps to start running, Verstegen taught him how to do it in a single lunge. Instead of accelerating off his feet, Verstegen taught him to use his whole body. Now it was time for Garciaparra to put those new movement techniques to work. Garciaparra hustled between the cones at gradually increasing speeds, honing what Verstegen calls "programmed agility," or his ability to change directions quickly between specific points. Garciaparra then graduated to work with the bungee cord attached to his body, which forced his muscles and nervous system to move faster and more powerfully.

Having improved his fundamentals and agility, Garciaparra progressed to the epitome of IPI's training, in which—like an athletic contest itself—the action is totally random. While still attached to the cord, he fielded all types of balls, from baseballs to tennis balls to asymmetrical rubber balls. After that, hustling a plain old baseball is easy. "When you take those cords off," Verstegen says, "you feel like you're flying." All the while, Verstegen made sure Garciaparra kept to his efficient body movements and jacked up his strength and power in the weight room.

Did it work? In 1997 Garciaparra hit 30 home runs, became the American League's rookie of the year and earned the moniker "spiderman" for his incredible fielding range. "It was unbelievable," says Garciaparra. He went from hitting a total of 25 home runs in the minors to hitting 30 in just one season in the majors. "I say Mark is responsible."

It's now just after lunch on a Monday, and I look on as Doug Strange, Jason Varitek and Turner Ward line up under IPI's million-dollar white fabric dome, which covers a playing field of springy green Astroturf. The three look like anything but elite athletes. "Is this a warm-up or a workout?" says Strange, breathless and looking worried after ten minutes of what is, in fact, just the beginning of IPI's standard warm-up, a series of crawling, walking, marching, skipping and lunging exercises. Ward, 33, and Strange, 34, both play for the Pittsburgh Pirates. Each has nine seasons in the majors and a body as battered as an old pickup truck. Both are just trying to survive a few more years. Varitek is a six-foot-two, big-boned, 230-pound, 26-year-old catcher with the Boston Red Sox. At the Georgia Institute of Technology, he was one of the most promising college baseball players in the country. As plenty of ex-college stars will tell you, that doesn't mean squat in the majors, and so, like everybody in the business, he's looking for any edge he can find.

To Verstegen, a 29-year-old, six-foot-tall, 200-pound former linebacker at Washington State University with a master's degree in exercise science and a chest like the Rock of Gibraltar, they're all babies. And babies have to learn how to crawl before they can walk, to walk before they can run. Mary Pierce has been working with Verstegen for almost two years. Nomar Garciaparra has been working with him for six years. Varitek, Ward and Strange, well, they aren't even toddlers yet.

Varitek is as strong as a bull but needs to boost his quickness and speed. Strange is surprisingly agile but needs to get even quicker if he's going to compete with players ten years his

Garciaparra spots his Boston Red Sox teammate Lou Merloni, who struggles to remain stabilized atop an inflated ball. At right Merloni works on a diagonal-movement exercise.

junior, and he needs to get more flexible and powerful, especially through his abdomen, lower back and hips—what trainers call an athlete's "core." Ward has been injured so often over the years (in response to the standard IPI questionnaire on injuries he wrote "whole right side") that he needs everything. Verstegen, together with his six deputies, formulates a program for each athlete.

At IPI it all begins with movement and strength. The most basic movements are the sprinting stride and first-step acceleration. "Acceleration is the foundation of everything you do," Verstegen shouts, ordering Varitek to sit on the ground with his leg stretched out in front of him. "OK," he says to Varitek, "point your toes." Traditionally, Verstegen reminds us, we've been told to sprint on the balls of our feet. He hits the ball of Varitek's foot. On impact, Varitek's ankle bends. "See, the same thing happens when he's accelerating and the ball of his foot hits the ground. His ankle flexes and the load gets dispersed." He tells Varitek to cock his toes up as far as he can toward his shins. He hits Varitek's foot again. This time the ankle doesn't bend. It can't, and the shock jolts Varitek's entire leg. "You run with the toe down and you lose force," Verstegen scolds. "I want you to forget everything you've ever been taught. Acceleration is just controlled falling. I want you falling forward, with your head, shoulders, hips and ankle in a straight line, your elbows snapping back, and your knees and cocked feet snapping up and down like pistons. Your feet aren't pulling, they're attacking and pushing."

Verstegen invites me to join in, and for the next hour and a half the four of us practice first-step acceleration and the biomechanics of running forward and moving side to side. First we simply lean forward at a 45-degree angle against a wall. Instantly, all of us find, our butts stick out. Verstegen shoves them forward, so that our bodies, from our ankles to our heads, are in a straight line. He tells me to lift my right knee straight up, as high as it will go with the toes cocked, and to hold that position, frozen in mid-stride. To do even this simple motion, I realize, requires a core strength and hip flexibility that I do not yet have. Verstegen claps and we switch legs, driving our right knees and feet down as hard as they will go while jerking our left knees up, toes cocked. Verstegen wants our feet to punch the ground so hard that our bodies actually jolt up, almost lifting off the ground. He claps, I pound the ground and there's nothing gentle about it; my whole body thumps. We go from one stride per clap, to two, then three, our legs driving up and down while we lean against the wall going nowhere.

We graduate to trying it for real. Each of us in turn leans on Verstegen in that mid-stride position. "Go!" he shouts, suddenly letting go. I discover that being released at such an extreme angle means either falling on my face or driving my feet down ever faster in a desperate race to catch up to my head and shoulders. "Attack! Push!" barks Verstegen. "Push out through the hips and through the ground. This is what's going to get you out of the batter's box."

After more than 30 years of sprinting what turns out to be the wrong

way, I find it's nearly impossible to do it right. My butt sticks out. I keep my head too far down. My heels kick up behind me. In minutes, my legs are rubber and I feel like an oaf. I'm not the only one. "We sure as hell never do anything as intense as this," says Strange during a break. Varitek mutters: "I feel like a klutz."

That afternoon, Verstegen herds us into the weight room. Forget all those simple bench presses and arm curls you see in most gyms. "Welcome to the house of pain!" wheezes Strange, pressing a pair of 45-pound dumbbells above his chest with his back and shoulders not on a bench but on a three-foot-diameter inflated ball. With every motion he must struggle to stay balanced. Doing so not only strengthens the same upper body muscles that would be engaged on a stationary bench; it also involves his balance, while bringing his feet, legs, abdomen and lower back into play. By the time Verstegen lets us go at 6 P.M., Ward, Strange, Varitek and I are staggering. "I'm going right to bed," says Strange.

Babe Ruth, it's fair to say, would be aghast. "Yeah, Ruth lifted weights all right," laughs Terry Todd, director of the Todd-McLean Physical Culture Collection at the University of Texas at Austin. "He lifted one beer at a time!" Todd tells of the time when the only conditioning most athletes did was practicing their sport. Your tennis coach would simply feed you zillions of volleys. Babe Ruth just played a lot of baseball. Even football players didn't touch weights. "In those days coaches believed that lifting weights would slow you down and tighten you up," Todd says.

THE MYTH OF THE MUSCLE-BOUND ATHLETE

ACTUALLY, OLYMPIC ATHLETES HAD understood as far back as the fifth century B.C. that resistance training improved athletic performance. But the myth of muscle binding, which developed in the late 19th century, did not begin to erode significantly until the 1950s. That was when exercise physiologist Peter Karpovich at Springfield College in Massachusetts realized that weight training actually made athletes not only faster but more flexible. Soon other scientists and coaches came to the same conclusion, revolutionizing American sports. Today, it's a rare college or professional team that lacks a full-time strength and conditioning trainer. The results have been startling. The serves of women tennis players like Lindsey Davenport and Venus Williams routinely top 105 miles an hour. Agile 300-pound professional football linemen are standard, as are smaller baseball players like Garciaparra who have the ability to hit dozens of home runs a year. After all, one guy didn't break Roger Maris' home-run record last year; two did, and they both smashed it. "Without question," says Dave Pearson, associate professor of exercise physiology at the Ball State University Human Performance Laboratory, in Muncie, Indiana, "athletes are getting bigger, faster and stronger."

This all accelerated in the 1950s when the Communist-bloc European countries elevated the study of human performance to a science. "The German University of Physical Culture and Sport in Leipzig, with its dozens of engineers, medical doctors, biomechanists, pharmacologists and physiologists, found that even the slightest change in nutrition and training could make a difference," Terry Todd says. "The population of East Germany was about the same as the state of New York's, but the country won more gold medals in the 1976 Olympics than the United States." It was not coincidental that Eastern-bloc trainers and scientists had by then discovered that the use of such drugs as anabolic steroids, which are now illegal, could be the difference between winning and losing.

In the 1960s and 1970s, scientists

Driving back and forth across the lines, Garciaparra and Luke Wilcox, of the Tampa Bay Devil Rays, engage in a drill called "lateral bounding" that increases explosiveness.

found out that weight training makes you stronger not just because your individual muscle fibers grow in size, but because the nervous system recruits a greater number of the right muscle fibers to do the job, and does so more efficiently, a process known as motor unit recruitment and synchronization. It's those neural changes that are ultimately the most important of all. Researchers learned that training in carefully planned cycles dramatically increases its effectiveness; that a training technique known as plyometrics (bounding and hopping exercises) augments a muscle's natural springlike tendency to store energy and snap explosively back when stretched; that exercising on an unstable platform triggers little sensors in your muscles called proprioceptors, which improves balance.

American Olympic track-and-field athletes, swimmers and weightlifters began to adopt the European approach, but most American college and professional team sports lagged behind. "The Europeans understood how complex a program really had to be," says Verstegen, "but over here the approach was just more bodybuilding." Says Pearson: "We're starting to recognize that speed and athleticism are more important than bulk."

ENVISIONING SPORT AS A CHAOTIC UNIVERSE

TRAINERS AND SPORTS SCIENTISTS like Verstegen see a contest as an endless series of split-second responses in the midst of a high-speed, chaotic universe where explosive bursts of acceleration, deceleration, agility, balance and a computer-like quickness are the things that push today's athletes over the top. To Verstegen, straight-line speed, raw strength and marathon-like endurance—once considered the keystones of athletic excellence—need support and integration with the other elements. "Watch," Verstegen says. It's Tuesday morning, and my three long-suffering companions and I are now running forward over several eight-inch-high hurdles, and then sprinting 90 degrees to the left after the last one. Varitek rat-a-tat-tats over, struggling to attack the ground and keep his toes up, but after the last hurdle he does a little two-step shuffle to turn and take off running. Verstegen doesn't miss a thing. "Every time he takes those two steps to pivot he loses time and muscle-power efficiency," he tells us. "But if he plants his foot and goes linear immediately, with no adjustment, he saves time and takes advantage of the stored energy in his muscles.

Varitek and the guys give the hurdles another try. Rat-a-tat-tat, explode. "Amazing," says Strange, marveling that such a simple change might make him quicker and improve his game. Now, in a slow and gradual progression, Verstegen will challenge his athletes' neuromuscular systems at increasingly complex levels. From walk to march to skip to run. From walk to skip to running with a skip to running with a skip while catching balls to running with a skip while catching balls while connected to, yep, that diabolical bungee cord.

As a kid Verstegen bulked up the natural way—playing sports, lifting weights and bucking bales of hay in the farm fields of his native Washington state. He was a football player at Washington State University when a disk injury in his neck put an end to that. In college, he became friends with a Swedish javelin thrower who introduced him to the intricacies of track-and-field techniques and a whole new mindset. "He taught me how comprehensive a program really needed to be," Verstegen says. "He was a student of methodology. He had his own 12-year plan and within that 12-

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year period, everything was systematically broken down by months. For him, weight training was just a tool, a piece of something much larger that included metabolic systems, technique, diet, everything."

As assistant director of player development at Georgia Tech—where Verstegen first coached Nomar Garciaparra and Jason Varitek—he began to focus more on athletic movement and coordination than pure strength. When three of his players were among the top 20 of the Major League Baseball drafts in 1994, the training world took notice. The following year, the Bollettieri Sports Academy invited him to create IPI.

"A high ponytail? That's what I like to see," Verstegen says as Mary Pierce saunters onto the Astroturf. Pierce's long blonde hair is pulled tightly back, and Verstegen likes to say that he can tell how hard she'll work by where her ponytail sits on her head. "Let's go!" he shouts, and they start the warm-up. In minutes Pierce is glistening with sweat; her grace and coordination are such that she looks like a turbocharged ballerina compared with the ballplayers I worked out with. She's so well balanced that during the walking and skipping and lunging movements she closes her eyes. We didn't even try that.

In the six weeks since she was last here, she's played in five tournaments and won two, and she's now the seventh-ranked women's tennis player in the world. "Tennis is mostly about confidence," her coach Michael de Jongh tells me as we watch her. "Mary knows she can hit with anyone. If they can't run her around, then watch out!"

After the workout, Verstegen mixes Pierce a high-carbohydrate and protein shake in his office. There is, he reflects, only one problem with the business he's in. The better his athletes get, the tougher it is for him and his crew. "The body adapts so rapidly that we have to continually change and find new ways to challenge a Pierce or a Garciaparra. When you work with an athlete for a long time, how do you push his or her envelope further and further? That's where the challenge for us comes in."

Carl Hoffman wrote about snowmaking in December. Alex Quesada photographed last month's Weather Channel story.

With another workout behind her, Mary Pierce enjoys a short-lived rest. The only time she and her fellow IPI sufferers can really relax is at night when they're asleep.

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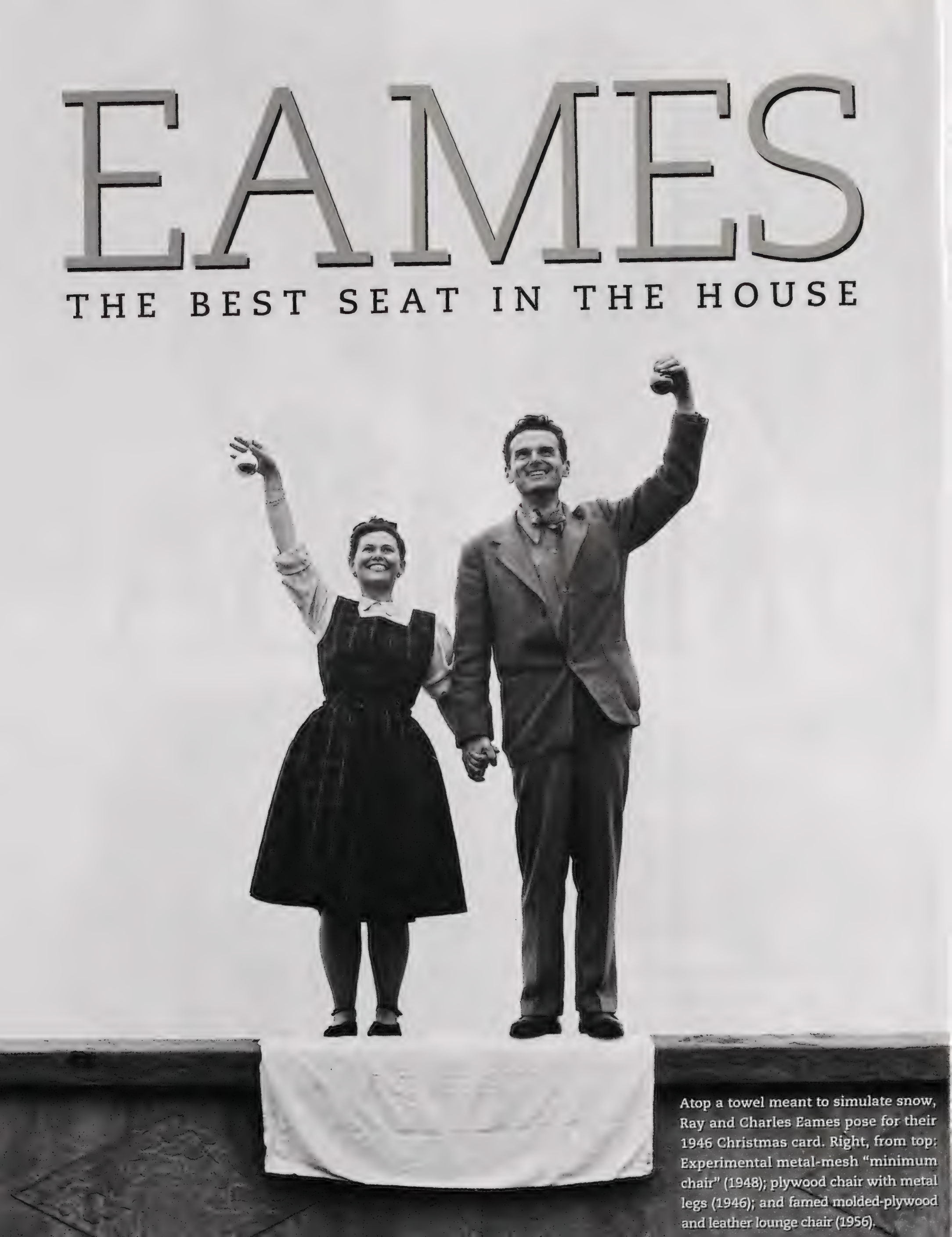
EAMES

THE BEST SEAT IN THE HOUSE



Atop a towel meant to simulate snow, Ray and Charles Eames pose for their 1946 Christmas card. Right, from top: Experimental metal-mesh "minimum chair" (1948); plywood chair with metal legs (1946); and famed molded-plywood and leather lounge chair (1956).

By Doug Stewart

FROM THE 1940S TO THE 1970S, CHARLES and Ray Eames, the husband-and-wife design team best known for their chairs, worked out of an anonymous former trolley-car repair shop in a seedy section of Venice, California. Their studio was a reflection of their fascinations: lathes and power saws competed for space with antique dolls, light tables heaped with slides of pastries and traffic signs, piles of cameras and lenses, and, jammed in with everything else, more than a dozen fish tanks.

The fish weren't there as decoration. Nothing in the studio, nor any detail in any of the architecture, films or furniture the Eameses designed, was there as decoration. The aquarium residents were the stars of films and slide shows that the Eames Office made for the U.S. Department of the Interior, which in the late 1960s was planning a national aquarium in downtown Washington, D.C. What other studio, asked to come up with an audiovisual presentation about sea life, would have groomed its own aquatic stars? Lights were kept in place around the tanks to ease filming. One octopus achieved celebrity as the longest-lived member of its

species known to science, thanks to a diet of crabs bred in a neighboring tank by one of the graphic designers. "The octopus got to be a ham," says Barbara Charles, a former researcher at the office. "Whenever the lights were turned on, it started swimming for the camera and getting in the way." The animal had to be given its own tank.

The stagestruck octopus had something in common with the owners of the premises, who were also hams in front of a camera. In countless photographs taken over the years, Charles Eames, dimpled and bow-tied, and his wife Ray (née Bernice), just five feet tall and invariably dressed in a pinafore, beamed for the camera like seasoned performers. As they sat delightedly on their chairs, held hands and said "Cheese!" while balanced on a beam of their just-framed house, or posed together on a motorcycle (Ray driving, Charles grinning behind her, smoking a pipe), they exuded a witty, fun-loving, all-American informality—in sharp contrast to Frank Lloyd Wright, with his capes and his edicts, and the dour, intellectual Europeans of the Bauhaus. In their designs, too, the Eames look was inviting and user-friendly. With creations like their still-popular 1956 lounge chair and ottoman, writes biographer Pat Kirkham, the Eameses gave modernism "a human face and a comfortable bottom."

Mid-century modernism is back with a vengeance these days—in interior design, furniture, fashions and television commercials—and everything Eames is hot. In the art and design press, the Eames name probably gets more ink now than when the pair was alive. (Charles died in 1978, Ray ten years later to the day.) The lobby of Philippe Starck's trendy Mondrian Hotel in Los Angeles is filled with mass-produced Eames chairs, as is Cesar Pelli's redesigned and renamed Reagan National Airport in Washington. An early version of one of the Eameses' 1946 plywood chairs, which are still being produced, sold at auction in London last November for $7,600—nearly 500 times what the chairs originally cost.

On May 20, the first posthumous retrospective in the United States of the Eameses' career opens at the Library of Congress in Washington. The exhibition runs through September 4, then moves to the Smithsonian's Cooper-Hewitt, National Design Museum in New York City from October 12 through January 9, 2000. It travels later to St. Louis and Los Angeles. The Library of Congress organized the exhibition with the Vitra Design Museum in Weil am Rhein, Germany, where an earlier version of the show opened in late 1997.

Independent curator Donald Albrecht directed the team that organized the exhibition and edited the companion book, *The Work of Charles and Ray Eames: A Legacy of Invention*, published by Harry N. Abrams in 1997. To upwardly mobile members of the postwar middle class, Albrecht says, the Eameses epitomized modernity. "Eames furniture represented good taste without extravagance." This still holds true. "After the excessive design styles of the 1980s and early 1990s, the Eameses' work looks remarkably fresh today," he says. Moreover, despite their endless mugging for the camera, the Eameses were essentially serious about what they did. "They believed in good design not just as a way to sell products but as a way to improve people's lives. They made comfortable chairs that were cheap and good-looking because they wanted everyone to be able to sit on good furniture. When they made a film about computers, they really believed they were improving people's lives by helping them understand the world around them."

When I was growing up, the most comfortable chairs in our suburban house, as in many homes of the 1950s, were the Eames chairs in our dining room. The factory-made, metal-legged "potato chip" chairs used contour instead of cushioning to

During World War II, the Eames Office produced molded-plywood leg splints (above left) for the Navy. Ray fashioned a series of abstract sculptures from such splints; the one above is from 1943.

JOHN HALPERN; BEN BLACKWELL; P.78 EAMES OFFICE© 1999/ LIBRARY OF CONGRESS, PRINTS & PHOTOGRAPHS DIVISION; P.79 THOMAS DIX/VITRA DESIGN MUSEUM (3)

fit the body. Like Calder mobiles, the chairs' thin molded-plywood seats and backs seemed to float in space. Of greater interest to my economy-minded dad, I suspect, was that all six cost him $100 in 1949. With the help of a little epoxy, the chairs endured five kids and more than 30 years of slouching and fidgeting, elegant to the last.

Despite the chairs' almost stark simplicity, the Eameses devoted years of trial and error to designing them and, with characteristic thoroughness, figuring out how to mass-produce them. Charles Eames in particular was always methodical. He was born in St. Louis, Missouri, in 1907. His father, a railroad security man and amateur photographer, died when Charles was young; like many a future ladies' man, Charles was raised as the only boy in a household of women. A late bloomer, he dropped out of college, got married, bummed around Mexico, and worked intermittently and without much distinction as a Depression-era architect. His only child, Lucia, was born in 1930. In the late '30s, he enrolled in Michigan's modernist Cranbrook Academy of Art, whose director, Finnish architect Eliel Saarinen, put him to work teaching industrial design.

Ray Kaiser, five years his junior, was the daughter of a Sacramento, California, theater manager turned insurance salesman. Exuberant and tough-minded, Ray from the start was a more resolute modernist than her future partner. After college, she studied painting with Hans Hoffman in New York and helped organize an activist group that picketed galleries hostile to abstract art. She came to Cranbrook to study weaving, metalworking and ceramics. A few months before the outbreak of war in 1941, Charles divorced his wife, married Ray and moved with her to Los Angeles.

By day, Charles designed sets for MGM Studios while Ray did graphic design work. By night, the newlyweds struggled to bend plywood. Charles had won top prizes the previous year in a competition held by New York's Museum of Modern Art with molded-plywood furniture he'd designed with Cranbrook architect Eero Saarinen, Eliel's son. Their one-piece chairs had proved impossible to mass-produce reliably, however; the wood cracked or splintered when forced into form-fitting curves. Now, in a spare bedroom, the Eameses built their own chair-molding apparatus—dubbed the "Kazam! machine"—using lumber pilfered from the MGM lot, power siphoned from a nearby utility pole and an old bicycle pump.

The Kazam! machine never really worked, nor did using their oven as a kiln (the contents once blew up), but the Eameses were learning. In 1942, with war under way and metal in short supply, they and several friends rented a shop to produce molded-plywood leg splints for the U.S. Navy. They experimented, too, with plywood airplane fuselages, even plywood fuel tanks. On the side, they kept tinkering with chairs, finally going to a two-piece shell, which required less wood and less bending and was clearly more sculptural. They attempted to attach the rubber shock mounts directly to the wood without ugly bolts by bombarding the glue inside the joint with a beam of radio waves—a crude microwave oven, in effect.

The result debuted publicly in 1946 at a remarkable one-man exhibition at the Museum of Modern Art, "New Furniture by Charles Eames." The show, an early example of Eamesian exhibition design, included a chair hanging upside down from the ceiling like a mobile, a revolving drum in which furniture bounced and clattered, splints

Eames staff (from left) John Whitney, Charles, Ray, Parke Meek and John Neuhart size up a one-fifth-scale model of the 1959 Moscow fair pavilion. Top: The Eames all-plywood dining chair (1945).

THOMAS DIX/VITRA DESIGN MUSEUM; EAMES OFFICE© 1999/ LIBRARY OF CONGRESS, PRINTS & PHOTOGRAPHS DIVISION

that Ray had transformed into abstract sculptures and a plywood children's stool shaped like an elephant. Eliot Noyes, the museum's director of industrial design, acclaimed the centerpieces as "the finest chairs of modern design." Of Eames he said, "With one stroke, he has underlined the design decadence and technical obsolescence of Grand Rapids," the nation's furniture capital.

Of course, "he" didn't do all this by himself. Charles Eames was the smiling public face for what was in fact a team of creative people. After the one-man show, several key colleagues left the shop, including Harry Bertoia and Herbert Matter. Don Albinson, who worked on furniture for the Eameses since their Cranbrook days, says wryly, "Somehow they thought it was a group effort they had undertaken to produce chairs for that exhibit."

Ray's role, too, was overlooked, as it was throughout their partnership. A 1950 *Life* magazine article about a visit to the Eames home hardly mentioned Ray; much later, a PBS documentary referred to her as a "delicious dumpling in a doll's dress." Yet her artist's sense of form, color and juxtaposition shaped nearly everything the Eameses did. In Ray's sinuous drawings from the late 1930s and early '40s, with suggestions of Calder and Miró, you can almost see the graceful petal shapes of the couple's future chairs emerging from the paper.

The timing of the 1946 show, if not its title, was impeccable. The end of the war was unleashing a peacetime building boom, and millions of young families had begun setting up house: peacetime Americans needed places to sit. The Herman Miller Furniture Company quickly signed a deal with the Eameses, beginning a lifelong partnership. In 1950, the couple realized their goal of a one-piece shell chair by molding fiberglass-reinforced plastic that had been used for radar domes during the war. The chairs were a runaway hit, though they lacked the elegance of their plywood predecessors. Today, in ads from the 1950s picturing luxurious homes outfitted with plastic armchairs, the interiors look incongruous and a bit tacky, as though the living room had been crossed with a laundromat.

The Eameses, who never used "chair" and "art" in the same sentence, had nothing against laundromat seating. Throughout their career, they claimed they worried much less about a product's looks than about how well it filled a need (though that might include the designer's need to make a good-looking chair). "You usually find," Ray once explained, "that what . . . works is better than what looks good. You know, the 'looks good' can change, but what works, works." Eames chairs worked. The utilitarian seating the Eameses designed in later years for schools, offices

The camera-crazy Eameses: as Charles (in lift) shoots the opening "picnic" scene for the film *Powers of Ten* (1968) outside their California office, Ray focuses on close-ups of the truck body.

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and airports has likely grossed in the neighborhood of a half-billion dollars.

The Eameses lavished attention on minutiae. Robert Staples, an Eames employee for 16 years, remembers having to design and cast eight different aluminum stretchers to go under the seat of a new series of chairs in 1958. "When the eighth one looked like the first, Charles finally decided, 'That must be the right design.'" All for something that went *under* the seat. "Charles would say a chair should look as good from the bottom as it does from the top."

The Eameses' obsession with detail extended to their own carefully crafted image as unaffected, charmingly casual people. Handsome and self-absorbed, Charles styled himself a "Yankee mechanic" who drove an old black Ford and wore mail-order, department-store shoes. Yet many of their clothes, including Ray's pinafores, were tailored by an Oscar-winning Hollywood costume designer. Even for an intimate dinner at home with close friends, they'd dispatch an employee ahead of time to make sure the candles were burned down to a comfortable length. Nothing was left to chance. Like the circus performers they often photographed, the Eameses believed in fun, but disciplined fun—"take your pleasures seriously," was one of Charles' mottoes. He and Ray designed toys and games, even a solar-powered "Do-Nothing Machine." For them, a well-made top or toy boat was an object lesson in the honest use of structure and materials.

The architecture of their own home (right), the one building on which the Eameses' reputation as architects rests, suited their innate theatricality. Designed with Eero Saarinen, the 1949 Eames House near Santa Monica wasn't intended as an architectural monument (although it is). Rather, the Eameses built it as a model for flexible, kit-built houses—"good family living machines." If chairs could be made both elegant and affordable, why not houses?

"The Eameses didn't want to do custom architecture," Eames Demetrios, Charles' grandson, tells me when I visit the home on a bluff overlooking the Pacific. Demetrios, 37, is a multimedia expert who now runs the Eames Office, which markets Eames-related designs and products. "They wanted this design to be extrapolated universally. Charles Eames used to say, 'The extent to which you have a style is the extent to which you have not solved the problem.'"

Despite its industrial-style trusses and turnbuckles, the house (which was never duplicated) is anything but a severe, minimalist box. Like a Mondrian painting in Sears, Roebuck paint, Ray's opaque colored wall panels break up the glass facade, which is shaded by a tall and fragrant file of eucalyptus trees. The house was originally to be a cantilevered pier jutting into the meadow alongside. Only after all the steel beams had been delivered, the Eameses later claimed, did they scrap their plans. "They realized they had made the classic architect's error," Demetrios says, "of choosing a beautiful piece of land and then destroying it with a building." Instead, using the same parts, they built a very different house—this one tucked into the hillside, leaving the meadow intact. To the Eameses, it was a

The Eames House's bright stucco panels and curtained expanses of glass blur the boundaries between indoor and outdoor space. Top: Wire-mesh chair with "Eiffel Tower" base (1951-53).

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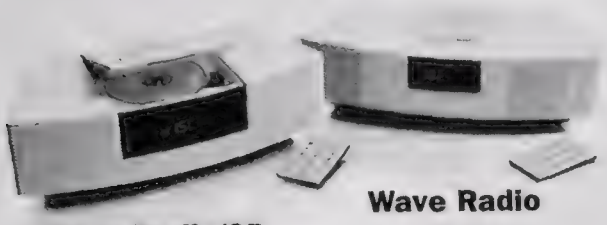

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triumph of the kit-of-parts aesthetic.

The most striking aspect of the house is its interior, which remains as the Eameses had it; Charles' daughter, Lucia, now lives here part-time. In the sun-filled living room, a couch is draped with layers of carpets and blankets. Japanese paper lanterns hang from the 17-foot ceiling. Everywhere are folk figurines, seashells, carved birds, wicker boxes, sculptures from India. The clutter strikes me as almost Victorian. During their first year here, the Eameses in good modernist style had kept the space mostly empty, save for a few pillows and tatami mats. Their love of accumulation soon won out. Demetrios speaks of the room as a pasture gone to woodland.

The Eameses had a passion for what they called "good things": everyday objects that were both useful and, to them, beautiful. Their house, in fact, is best understood not as a three-dimensional object to be admired in itself but as a transparent enclosure for good things, from driftwood to fish and animal traps (which helped inspire their wire-furniture series).

"Charles and Ray were real pack rats," says C. Ford Peatross, of the Library of Congress, when I visit the Eames archive there. Peatross, who helped plan the retrospective, is curator of the library's architecture, design and engineering collections. "Ray used to keep candy that people sent her . . . for the wrappers," he adds, almost in a whisper. Before her death 11 years ago, Ray bequeathed the Eames Office's archives, candy wrappers and all, to the library. Peatross and other library staff spent years with her organizing the material for the transfer. It eventually took two tractor trailers to transport it all to Washington.

In a vast windowless room in the library's Madison Building, I examine some of the nearly half-million images in the trove, including studies for 1940s magazine covers for *Arts & Architecture* designed by Ray and a deep-shadowed photograph of a plywood splint, as dramatically lit as a glossy glamour portrait. "The Eameses documented everything they did with photographs," Peatross says as I study a picture of a very young Charles Eames gamely strapped to a plywood litter. "That's the way they studied things." I open an album of contact prints, a visual diary of what Charles shot with a particular camera on a particular day in 1947: candies in a box, buttons on a blueprint, an entire roll of pigeons taking off. Peatross recalls one of the office's midday rituals in the early 1980s, the delivery of a cake from a local bakery. "You'd come by, and people would be photographing it. After a slice was taken out, the cake would look different, so they'd photograph it again."

The Eames Office was a world apart, with little relation to the rest of Los Angeles or the design world beyond. Employees were mostly young, mostly bright, and learned on the job. "People might be hired not because they were good draftsmen but because their hobby was gold-leafing or insect-collecting," says Alex Funke, who arrived as a film-school graduate in the late 1960s. Funke found himself not only running a movie camera but interviewing scientists, doing historical research—and feeding the fish.

Improvisation was the rule. "The whole place was jury-rigged," says Parke Meek, a 25-year veteran of the Eames Office. Meek used a vacuum cleaner to suck artwork against a perforated board for the shooting of the film *Powers of Ten* in 1968. When Charles suggested he build a film-editing stand, Meek said he'd visit a shop to see how they were made. "Charles said, 'Don't do that. You'll only get discouraged.'" Meek made his own version with parts scrounged from a 78-rpm record player and an old Bell & Howell movie projector. "To Charles, if something was really laborious, it was good."

Working for the Eameses was indeed hard work. Even top-spinning, an approved office sport, was done competitively. Radios and gum-chewing were frowned on, says former employee John Neuhart. He remembers Charles walking up as a man on a nearby camera crane whistled. "I could see the muscles constricting in Charles' throat. I said, 'What's wrong?' He said, 'That—god—damn—whistling. When

An amoeboid sculpture for sitting, Ray's 1948 brainchild, La Chaise, has been mass-produced since 1990 by Vitra Design. Top: Charles wears grid face makeup applied by Ray for Halloween.

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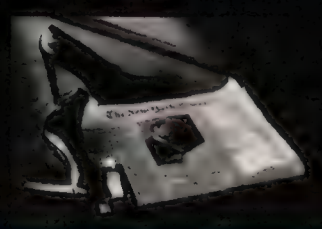

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you're whistling, you're not thinking.'" To Charles, every task demanded vigilance, Neuhart says, since no problem was ever completely mastered—just as no detail was ever truly insignificant. In the projection room the next day, the footage proved to be blank. "The person who shot it said, 'Oh, the shutter was closed!' Charles turned to me and said, 'Whistling,' and walked out."

The studio was officially the Office of Charles and Ray Eames, but it was Charles who was head guru and CEO. The shift from furniture to films and exhibitions—from object design to information design—was a natural extension of his enthusiasms. In all, the Eames Office made nearly 100 films that typically blurred the line between entertainment and education. As Charles explained, "They're not really films. They're attempts to get across an idea."

Just as the Eameses indulged in object overload in their interiors, a trademark of their films was information overload. In 1959, the studio produced a groundbreaking short film, later called *Glimpses of the U.S.A.*, for a U.S.-Soviet cultural fair in Moscow. Some 2,200 Technicolor images, both slides and film footage, were projected on seven 20-by-30-foot movie screens simultaneously. The film was a mosaic of one workday and a weekend day. "Much is to be done, most of it in a hurry," Charles intoned in the brief opening narration, introducing a medley of freeway interchanges, skyscrapers and crowded sidewalks, crop dusters and farmworkers, then playgrounds, ranch homes, picnics, nightlife. It was propaganda, but subtle for its day. Muscovites thronged to get in, then emerged teary-eyed 13 minutes later. The pavilion floor had to be resurfaced several times during the six-week run.

Five years later, the Eameses went even further. Under the buttoned-down auspices of IBM, a major patron, they offered a foretaste of the "happenings" of the late 1960s with a 22-screen multimedia presentation called *Think* at the New York World's Fair. Although its subject—the uses of abstract reasoning—wasn't the usual stuff of blockbusters, the film's over-the-top presentation made it a must-see attraction, drawing two-hour lines outside IBM's 500-seat egg-shaped theater. The Eameses toned down their presentations thereafter. "If you give a small boy a hammer," Charles remarked, "he will discover that everything he encounters needs hammering. If you give an old man several screens . . . "

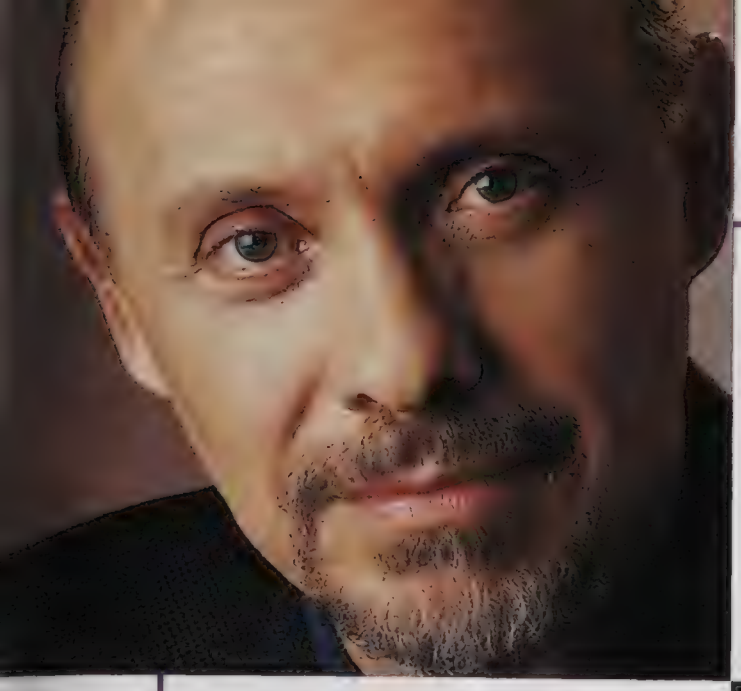
Powers of Ten remains the classic Eames film. Watching the movie, you look down on a picnicker napping in a park as the field of view steadily widens. With its fixed perspective, you seem to be zooming upward at a rate of a power of ten every ten seconds. Within a few minutes, our galaxy is a white dot. Zooming back down again, you wind up inside a carbon atom in the picnicker's skin. As elegant and deceptively simple as an Eames dining chair, this is the only educational film I've ever seen that approaches the level of poetry.

Some of their films were personal explorations of life's overlooked good things: toy trains, clown makeup, soapy water on asphalt. *Bread* (1953) is a wordless pageant of close-ups set to chamber music: scythes cutting wheat, a baker's hands kneading dough, a knife sawing through a fresh loaf, fingers twisting apart a brioche, and finally pigeons pecking at crumbs on a beach—the full experience! When Charles used this as an exercise for an experimental design course he helped teach at UCLA, Ray, offstage, piped the aroma of freshly baked bread into the auditorium. (Continuous showings of this and other Eames films, including a new seven-screen video version of *Glimpses*, are part of the retrospective.)

In their exhibitions, too, the Eameses went for sensory overload. Their 1961 show "Mathematica," with 512 lightbulbs performing multiplication and 30,000 randomly cascading plastic balls forming a bell curve, still draws crowds to Boston's Museum of Science. The Eameses also had long-standing ties to the Smithsonian Institution, for which

Consummate performers, Charles and Ray ham it up on a borrowed Velocette motorcycle in 1948. Top: Their fiberglass-reinforced plastic chair (1954) boasted a seat made out of a single shell.

THOMAS DIX/VITRA DESIGN MUSEUM; EAMES OFFICE© 1999/ LIBRARY OF CONGRESS, PRINTS & PHOTOGRAPHS DIVISION



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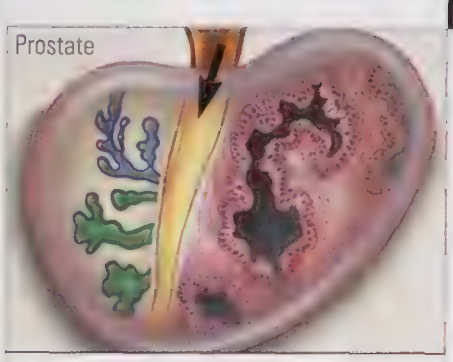

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they organized the exhibition "Photography & the City" (1968) and produced two films. The first, in 1965, chronicled the life of James Smithson and the museums' vast holdings; the second, titled *Copernicus* (1973), was created using stills Charles shot of the astronomer's original works in Krakow.

Ray's role in the films and exhibitions was less direct than Charles', but she was usually closely involved. Jehane Burns Kuhn, a longtime Eames employee and friend, recalls the installation of "The World of Franklin and Jefferson" at New York's Metropolitan Museum of Art in 1976. "Ray loved accumulation and was very good at it. She had an array of 18th-century objects in a case that ought to have looked cluttered but didn't, because of the way she arranged them. I once saw Charles remove an object or two from a case against Ray's squeals of dismay, but that was one of the rare times I saw him overrule her." Eames films and interiors were often dressed up with flowers, kites and other decorative flourishes. The conventional wisdom is that this was Ray's touch, while Charles preferred a cleaner look, but that may be an oversimplification. Long before he met Ray, Charles with two friends decorated a St. Louis apartment for a party by painting 132 Easter eggs and hanging them from the ceiling; there is no record of Mies van der Rohe ever having done the same.

With their onslaught of images and ideas, the Eameses challenged audiences to grapple with complex ideas. Dumbing-down was never the Eames style. The studio worked closely with a number of top scientists, including physicist Philip Morrison, of M.I.T., and astronomer and historian Owen Gingerich, of the Harvard-Smithsonian Center for Astrophysics, to find out what excited them. "One of the best kept secrets in science is how unpompous scientists are at their science, and the amount of honest fun that for them is part of it," Charles once wrote. His goal was "to let the fun out of the bag."

The broad sweep of the Eameses' work—from furniture showrooms to nature films, mathematical slide shows to history exhibitions—testifies not only to their wide-ranging curiosity but also to their belief that knowledge, properly packaged, could entertain. The similarity between a teeming Eames exhibition or multiscreen film and a three-ring circus is not accidental. For both Charles and Ray, the circus was a lifelong passion. Aside from its obvious attractions, the behind-the-scenes workings of a nomadic carnival offered useful lessons for designers and others, they believed. "Everything in the circus is pushing the possible beyond the limit," Charles wrote a few years before he died. What seems freewheeling and frivolous "has a discipline that is almost unbelievable." Given the Eameses' own taste for showmanship, it's unclear if Charles was completely serious when he'd tell people that he and Ray had once planned to enroll in clown school together. But he might well have been. Charles and Ray Eames took their pleasures seriously, and they revealed the pleasures at the core of serious things.

Doug Stewart wrote for SMITHSONIAN *last month about the mysterious American obsession with lawns.*

The multitalented Eameses look right at home amidst the eclectic arrangement of pillows, plants and objets d'art that filled the two-story living room of their steel-trussed, "kit-built" California home.

JULIUS SHULMAN

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give you paws

WHEN GRIZZLIES AND BLACK BEARS START HANGING AROUND PEOPLE, CARRIE HUNT AND HER FEISTY KARELIANS PERSUADE THEM TO GO AWAY

BY MARK DERR

PHOTOGRAPHS BY TED WOOD

AS THUNDERSTORMS BATTER THE mountains to the east and west of Polebridge, Montana, early one June afternoon, Carrie Hunt eases her pickup into the narrow dirt driveway to a small log cabin. She climbs out and goes inside to talk with the owner, Tom Reimer, a former Glacier National Park employee, about the grizzly bears that have been turning up with alarming regularity in his yard. Hunt no sooner enters the cabin than Cassie, her top Karelian bear dog, cuts loose in the truck's camper shell with a deep, rapid bark. I get out and spot, 20 yards away, a dark brown grizzly. It's the 3-year-old male code-named Big Creek. That's the place where, last fall, Hunt's frequent partner, Tim Manley, a Montana grizzly-bear management specialist, trapped, radio-collared and released him to a barrage of rubber bullets, exploding cracker shells and the loud barking of several Karelians—all intended to reinforce the bear's wariness of people.

The young grizzly was suspected of getting into trouble then, and recently he has definitely been doing so. As I head for the cabin to summon Hunt, she and a shotgun-toting Reimer come down the steps. "We're going to work this bear," she says matter-of-factly. Opening the truck's tailgate, Hunt clips a six-foot-long purple nylon leash on Yoki, a 17-month-old Karelian who is beginning his first season in the field, and hands it to me. She then fastens an identical leash on 8-year-old Cassie.

Even when off duty, Karelians look ready to pounce. From left: Rio, Carrie Hunt's top male; Eilu, a female born in Finland; Cassie, the team leader; and 3½-year-old Gila.

While we walk to the edge of the clearing, Cassie barks furiously at the bear. Yoki bounds around, attempting to play with Reimer's Brittany spaniel. Staring at us, the grizzly makes no move to leave. It is that lack of wariness Hunt wants to reverse. At her signal, Reimer fires two blanks from his shotgun. Yoki cowers but recovers as soon as we take off in pursuit of the fleeing bear, Cassie barking, Hunt and me yelling, "Get out of here, bear! Go away, bear!"

We stop 50 yards later, when the Big Creek male decides to hunker down in a dense stand of lodgepole pine saplings. His reward for deferring to his pursuers is peace and quiet. "See, he's chosen to do the right thing," Hunt says. "We're telling him that if he wants to pass through here, he must remain under cover and stay away from cabins."

The aim is not to banish bears but to encourage a kind of peaceful coexistence.

Like us, the dogs are still pumped. Looking at them, I reflect that they are our only defense should the bear decide to attack, but I feel safe. Hunt and Cassie invented this drill and have used it on more than a hundred black and grizzly bears from New Mexico to Alaska, some of them much more aggressive than this one.

Back on the road, Hunt worries aloud that Yoki acted gun-shy and did not bark at the bear. She has plans for him to be the new top stud in her kennel. Before he can fill that role, he must prove he is able to pursue bears loudly and fearlessly, without cowering whenever a shotgun is fired. But he is still young and she is patient, a key attribute in training dogs—and bears.

Wildlife biologists identify two types of nuisance bears. Although they still forage on naturally occurring foods, "habituated" bears have lost their wariness of people and hang around roads, campsites and homes. "Food-conditioned" bears are more aggressive, actively seeking to obtain food from humans. Not all habituated bears become food-conditioned, but the longer they live near people, the greater the likelihood that they will.

The damage done by bears adds up to hundreds of thousands of dollars annually. The animals raid bee yards, orchards and other croplands, campgrounds and cabins. (Bird feeders, interestingly enough, are a major factor in the habituation of bears to people.) Occasionally, they prey directly on livestock. In Yosemite National Park alone, black bears destroy approximately $600,000 worth of property a year, including damage to cars, which the more ingenious among them peel open like sardine cans in order to steal food.

It's not just property that's at stake. Habituated and food-conditioned bears can be more dangerous than "wild" ones. According to Stephen Herrero, professor emeritus at the University of Calgary and the world's leading expert on bear attacks, most of the dozen people killed by grizzlies in North America over the past several decades were victims of animals that had lost their fear of humans. It's impossible to say how many people such animals frighten or injure each year, but there are dozens if not hundreds of incidents.

When bears become troublesome, wildlife managers usually trap and tranquilize them, then transport them to remote wilderness areas. About half of those animals end up back in trouble within a year and most of them have to be destroyed. Clearly, since there are only 1,000 grizzlies left in the lower 48 states, an alternative to relocation is urgently needed. Attempts to instill wariness of humans in problem bears by shooting them with rubber bullets and other nonlethal rounds have met with only limited success. Now Hunt and her Karelians offer yet another approach. The aim is not to banish bears from settled areas but to encourage a kind of peaceful coexistence.

A wildlife biologist, Hunt has been working with bears for more than 20 years. She calls what she does with

Hunt and Cassie lead a team in hot pursuit of a bear in Glacier National Park. At right, a female black bear pauses beside a tree in the same vicinity.

her dogs—driving bears away from places where they don't belong—"shepherding." She believes most troublemakers are smart enough to learn after one or two sessions to avoid people. Some, like the Big Creek male, need periodic refreshers.

Hunt's bear dogs are native to Karelia, a region along the Finland-Russia border. They are renowned for their hunting and guarding skills. Black-and-white spitz-type dogs with curly tails, they weigh 40 to 65 pounds. They have powerful hindquarters, a deep chest and close-set brown eyes the Finns say burn with intelligence and desire. Although they are bred to chase their prey and hold it in place, barking, until help arrives, Hunt's Karelians generally work close to their handlers on a leash.

The Finnish Kennel Club's official breed history states that at the turn of the century, stories were told in Karelia about "the brave dogs of the local people, dogs that often had saved their masters' lives, when they had gotten in a close contact with a bear." One account praised their steadfast obedience: "No matter if it was a

bear, lynx, moose, deer, hare, wild fowl or water fowl, always did these dogs as their master wished."

In the 1930s, the Finnish Kennel Club moved to consolidate the breed. After the Soviet-Finnish War of 1939-40, most of Karelia was part of the Soviet Union and the breeding population in Finland had fallen to fewer than 100 dogs. While the Finns made a concerted effort to preserve the Karelian, Russian breeders reportedly crossed it with the Utchak sheepdog to create a more aggressive animal that would fight with brown bears. Today, fewer than 900 pureblood Karelians are registered annually by Finnish breeders.

In the early 1980s, Hunt learned from the Norwegian bear biologist Ivar Mysterud that he was using a Karelian to locate brown bears. It occurred to her then that Karelians might be just what she needed to shepherd nuisance black bears and grizzlies. The problem was to locate the right dog. Unable to go to Finland, she searched off and on for years among the handful of Americans who had begun importing Karelians as pets or guardians. Finally, in 1990, she found a 4-week-old puppy in Wyoming that proved to be one of those "perfect" working dogs that comes along but rarely.

Cassie was courageous, inquisitive and intelligent, with a fine nose and keen eyesight. She was also a tireless barker. More important, she seemed to have an intuitive grasp of what Hunt wanted.

Next, Hunt acquired Rio, a mostly white male Karelian, and it wasn't long before she had a program going. Over the years, Cassie and Rio produced 18 pups. They were all raised in the same way—long walks in the mountains near Hunt's home in Heber City, Utah, involving exposure to streams, cliffs, wildlife and people. At ten weeks, the youngsters are ready to be placed with researchers or wildlife management specialists, who start obedience training and exposing them to bears.

Tim Manley took his Karelian, Tess, from Cassie and Rio's second litter. He introduced her to a trapped and tranquilized grizzly bear the first week he had her. "She wasn't thrilled but we took it slow. We tracked bears in the snow and did obedience work. When she was 9 months old, she treed four black bears."

Just shy of 3 years old when I met her in Polebridge, Tess was more experienced working off the leash with grizzly bears than any of Hunt's ten dogs, including Cassie and Rio. Hunt prefers to keep her animals leashed because that way she can control their pace and response to the bear. Manley prefers a leash, too, but he frequently works alone in the middle of the night and at such times

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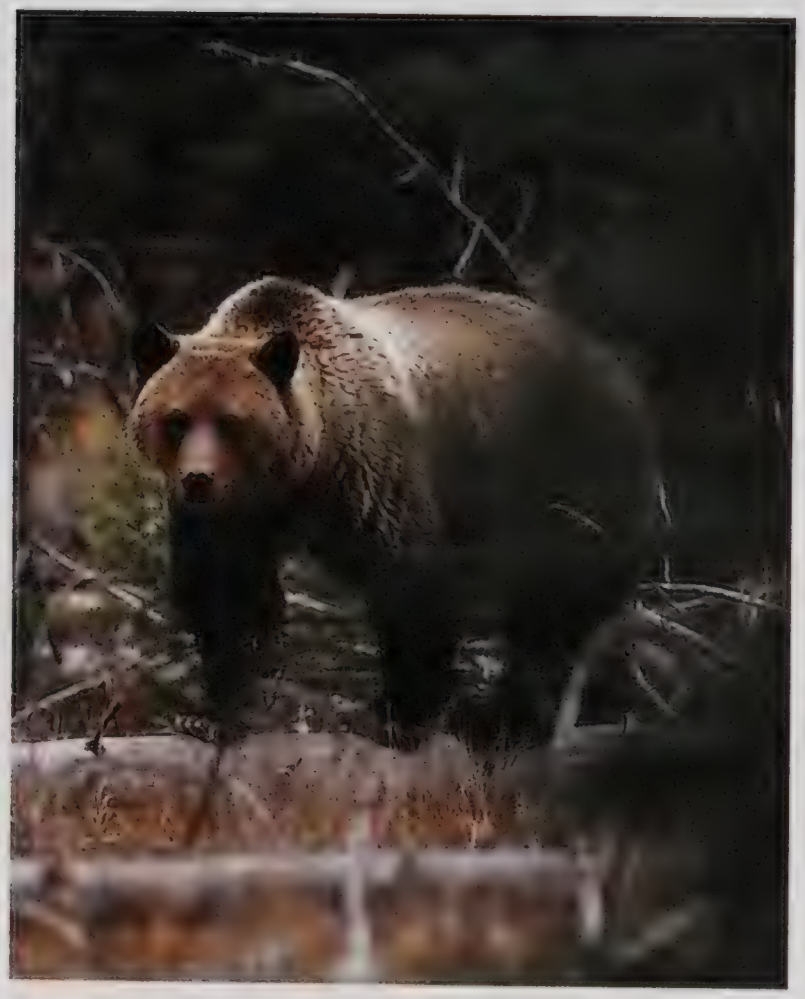

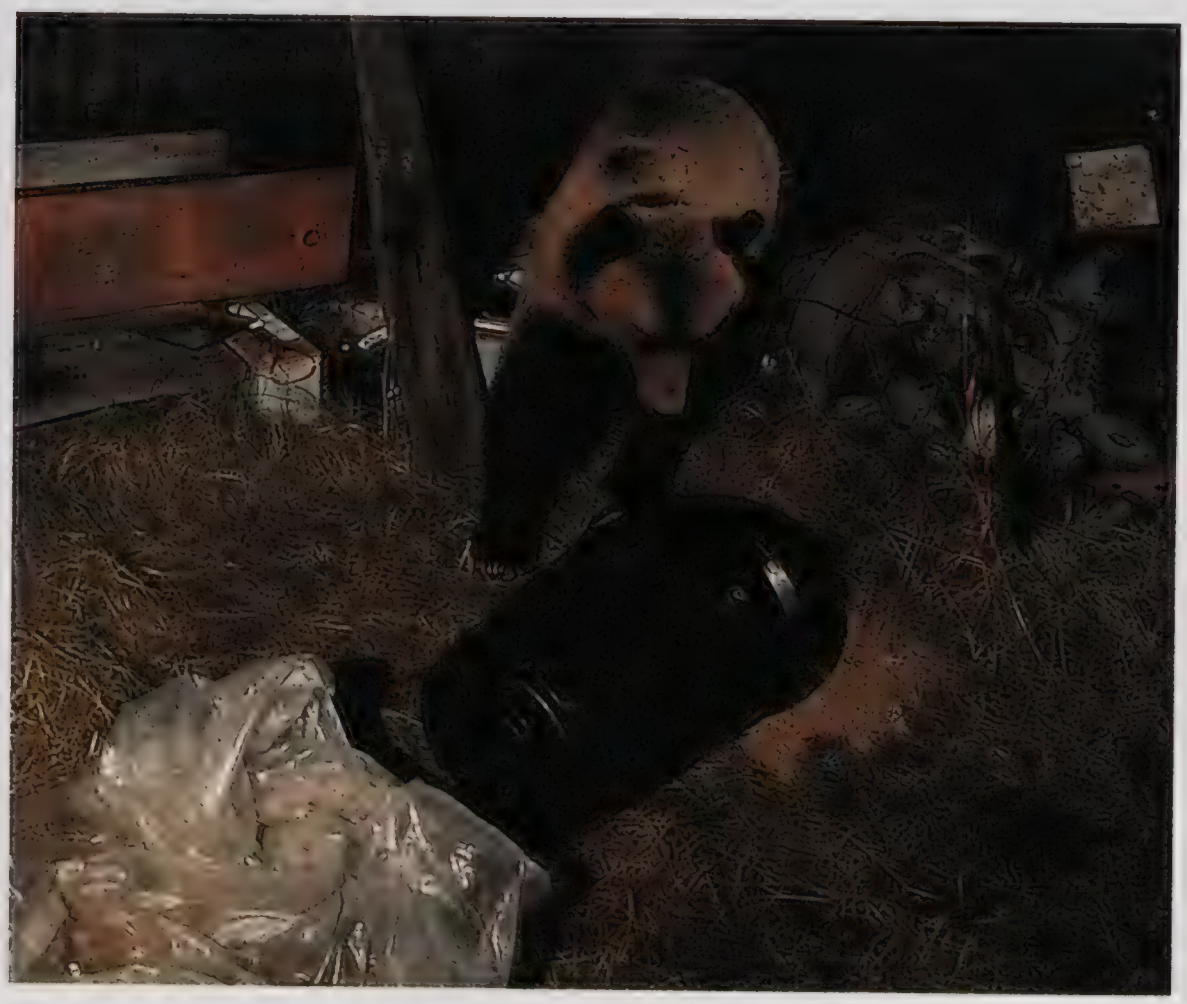

must be able to count on a free-ranging Tess to assist him in locating and handling bears.

Karelians are courageous. Hunt tells of the fall night a couple of years ago, in Montana's Bob Marshall Wilderness, when she, Manley, Cassie and Tess defended a hunting camp for five hours from a menacing male grizzly that was intent on stealing food. They kept the hunters' tent at their backs while the grizzly raged in the dark. Both dogs stood firm before their owners, turning to face the grizzly as he circled the campsite looking for a way past them. "Cassie barked the entire time," Hunt says. Not ordinarily a great barker, Tess followed her mother's lead. "That bear never came over the top of us."

Hunt intended to begin teaching that male to avoid campsites altogether, but the next day they found out that he had hauled an elk carcass out of another camp a mile away. She and Manley had neither the time nor the resources to spend on such a dangerous animal, especially during hunting season when elk carcasses abound and many hunters do not take steps to keep them out of reach of bears. Manley's supervisors told him to shoot the grizzly. It was the only bear of the 60 he and Hunt and their dogs worked with that year, including 19 grizzlies, that had to be killed.

There are certain situations involving hardcase panhandler bears that Hunt and her dogs cannot change. Yosemite National Park in California has had a bear problem in several heavily used campgrounds for years. The reason is obvious. Campers congregate in a few congested areas, where black bears have learned that food is almost always available in cars, on picnic tables, in tents and so on. In the summer of 1996 and again in 1997, Hunt, her assistant, Angela Klinefelter, and park rangers used Eilu, and Cassie and Rio and their offspring, Tuffy, to run bears away from the Tuolumne Meadows campground. Not long after Hunt left, the bears came back. Park officials concluded that the dogs could not reeducate those bears, which are still around. Instead, officials are going to have to do a better job of educating campers about food security.

There's no question Hunt's Karelians are obsessed with bears. Even if one is not around, they grow more alert whenever they hear the click of a shotgun being loaded. Once they're out working on the ground, they stare intently at their quarry, ready to spring into pursuit or hold their ground and bark, whichever their handler requires. Many times, especially if a bear is foraging near a road, they simply bark from the truck. They continue barking until the bear is out of sight or they are told to stop.

"These dogs are not for everyone,"

To identify a problem grizzly, Montana wildlife officials left previously spilled grain in a shed near Glacier. Photographer Ted Wood's flash equipment scared the animal away before it could eat. After grizzly specialist Tim Manley inspected the point of entry, the radio-collared animal was caught in a trap (above) and chased off by dogs.

During a lunch break with her assistant, Angela Klinefelter, Hunt feeds a tidbit to Tuffy. Tim Manley sits in the back of the camper with his Karelian, Tess.

Hunt says. "They do not make good pets. They are working dogs. They don't want to stay around the house or stick to your heels when you're hiking." Hunt's dogs behave themselves around strangers, toward whom they are polite but aloof.

Several years ago, Hunt established the nonprofit Wind River Bear Institute in Heber City to support her program. She has kept it afloat using her own savings and $225,000 in donations from her father. Meanwhile, she has continued working with her dogs in Alaska, Yosemite and northwestern Montana, often for a third of the $10,000 a month it takes to keep herself, one assistant and as many as six dogs in the field for her typical 14- to 18-hour days. She has done so because she believes it is important to convince state and federal wildlife officials that dogs deserve a much more prominent role in bear management.

She seems to be succeeding. "It's an impressive thing to see a bear change its behavior in several hours," says Steve Gniadek, wildlife biologist at Glacier National Park. After watching Hunt, Manley and their Karelians teach bears to avoid roads and campsites in Glacier, Gniadek helped convince his bosses to use dogs in the park's bear-management plan. One result: Hunt got a contract with the park, the U.S. Forest Service and Montana to shepherd nuisance bears throughout Glacier and its environs.

Now, after sending a message to the grizzlies around Polebridge, Hunt and Manley drive over to Many Glacier Valley on the park's east side. A number of black bears are causing traffic backups there and raiding campsites and dumpsters for food. It turns out to be Yoki's day to begin fulfilling his promise. Barking furiously, the young Karelian drives a startled black bear from the roadside and up a tree. He persists until Hunt calls him off, praises him and rewards him with food. Hunt tells me that Yoki has made it clear to this bear that if he comes too close to the road, he will find not food but a snarling dog ready to tree him.

"The dogs can convey complex messages," says Stephen Herrero. "They enable us to do things we've never done before. They can help us save bears."

Freelance writer Mark Derr lives in Miami Beach. Ted Wood, who took the pictures for "The Horse Whisperer" in the May 1998 issue, is based in Jackson Hole, Wyoming.

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Hooked to the top of a 105-foot aerial ladder, Recruit Bryce Womack will have his hands free to work. Right: The entire class prepares for another round of the all-important physical training.

TUCSON RECRUITS LEARN THERE'S A LOT MORE TO FIGHTING FIRE THAN JUST "PUTTING THE WET STUFF ON THE RED STUFF"

Training to Slay the Dragon

WHEN I THINK OF FIRE, I SEE campfires under cold starlight, or Moses chatting with a burning bush. When my brother, one of the nation's 276,000 career firefighters, thinks of fire, he sees an upside-down river of gold streaming across ceilings, pooling in high niches just as water pools in depressions, and pouring up walls like inverted, glowing waterfalls: since heat rises, firefalls cascade upward. "We see things," he says, "both beautiful and terrifying, that people in other professions will never see." In Tucson, Arizona, where my brother works, Fire Chief Fred Shipman remembers the beautiful dark eyes of the small girl he carried 100 feet down through smoke and screaming to safety. Battalion Chief Alan Moritz remembers finding another child curled up in a closet; the body was so blackened and disfigured that it took him awhile to realize what he was looking at.

Most of us will stare mesmerized at tamed fire by the hour, but we are all hard-wired to flee fire's touch. In a cynical world, the firefighter remains one of our ideal figures of bravery and heroism. What makes certain

BY JENNIFER LEE CARRELL

PHOTOGRAPHS BY TERRENCE MOORE

Trainees quickly extinguish a car fire, ever mindful that an explosion of gasoline vapor could launch the bumper like a missile.

individuals not only brave enough to quell the instinct to run, but skilled enough to turn and fight?

It's June 1998, and in the desert south of town, Chief Moritz and his lead training captain, Jim Napier, along with four more captains, an engineer and a paramedic, are preparing to knock more than a century's worth of collected knowledge and experience into the minds and bodies of 42 recruits and, to a lesser extent, me, as a participating observer.

"I like to call them my Jedi Knights," says Chief Shipman of the men and women who serve under him, and he's only half kidding. Going into the dragon's throat: that's what firefighters call moving into battle with red, roaring, ripsnorting fire. Increasingly, the nation's firefighters are also the first responders to medical emergencies; call 911 and you're likely to get a crew of firefighters who are also emergency medical technicians (EMTs) or paramedics. Sixty percent of their calls are medical, but the great enemy is still fire. Learning to fight fire, though, is "a lot more involved than just putting the wet stuff on the red stuff," notes Capt. Brian Delfs.

One of their earliest lessons is that water, their best weapon, is no more than a reluctant and fickle ally. At the end of the first week, the captains order the recruits two at a time into the water-filled, brush-lined lane called the Mud Bog and dump "charged line," or water-filled hose, into their hands. The point is to drag that hose 100 feet down the lane, keeping the lance of white water aimed steadily into the center of a suspended automobile tire. These are one-person hose lines, but today there will be a captain backing up each recruit. "Don't quit," yells Capt. Jeff Thompson. "We'll be behind you, so we're gonna know exactly how much effort you're putting in. Don't let us down." "Open 'em up!" yells Captain Napier, and the first two recruits open the valves and begin their long march down toward the tires.

No more than 10 or 20 feet out, all but the burliest of the recruits begin to struggle with the growing strength and wildness of the hose. The smallest member of the class wonders aloud whether the captains are holding them back, and Captain Napier orders her back into the mud to try again, with less help. When I try, I see why she made this mistake: it does feel like someone's tugging on the line. That "someone" is no captain, however, but Sir Isaac Newton: for every action, there is an equal and opposite reaction. With 95 gallons of pressurized water shooting out its front end every minute, the hose does its best to go walloping backward, but woe to the recruit who lets it: these hoses can buck and kick with the strength of an angry mustang. Even these "small" lines can break an arm or a leg.

After the last recruits slog down the

A recruit, with a captain right behind him, has pulled the hose through a hundred feet of mud, always aiming at the tire target.

lane, forcing the tips of their nozzles into the tires and collapsing forward with loud groans, Napier gathers everyone in the deep end, reviewing today's lesson: though strength helps, fighting fire is more about technique and heart than brawn. They've just proved that they have the heart. In the upcoming weeks, they will learn the necessary technique. What the recruits are left to figure out for themselves is that the captains are right behind them, pulling for them, sometimes literally. "You people are a filthy mess," snaps Napier, and his charges catch their first glimpse of his mischief when the captains open a hose on them.

For the recruits, just getting to Day One of the academy has been an odyssey. With more than 1,500 people applying for 42 positions, this year it was statistically more than four times harder for applicants to get into Tucson's firefighting academy than to get into Harvard. "It's like winning the lottery," grins Brett Welander, though his preparation has been a lot more involved than just buying a ticket; he's been working toward this since graduating from college two years before, taking fire science and emergency medicine courses, and working for a smaller fire department.

Tall and 20, Bryce Womack is the youngest recruit. Most hover around the age of 30; the oldest is 38. Seven are women. Traditionally, the fire service has drawn heavily from the military as well as from the ranks of mechanics and construction workers, and this class is no exception. But these recruits also count among their number several paramedics and lifeguards, a skydiving instructor and a mail carrier, a nanny, an English teacher and two massage therapists. They are athletic, outdoors people, many of whom share an addiction to risk: for fun, they fly, ski and scuba dive, ride Brahman bulls, or climb near-sheer faces of rock.

It used to be that recruits were selected primarily for their brawn; now the fire service demands brains as well. Half these recruits have college degrees, but their kind of intelligence does not require the sheltered hush of the ivory tower. They prefer the challenge of thinking through the thud and bang of a heartbeat in overdrive, with lives swaying in the balance: a stranger's, their comrades', their own.

Getting in was hard, but the real saga is just beginning. "It's a brutal process," says Chief Moritz. With a friendly manner that only strengthens his authority, he opens orientation by telling anxious families that their loved ones are about to disappear for 21 weeks. Now and again, they will resurface, openmouthed, to feed, after which they will immediately fall asleep. Then he gets to the bad news: although the recruits have staked everything on this academy, not all of them will graduate. In previous class-

One recruit helps another put on her fire-resistant hood. The protective gear is not actually fireproof, so she will have to act accordingly.

es, between a quarter and a third of those who started have given up or been let go.

Week by week the strain will mount as the recruits face a barrage of skills tests and written exams; failure to pass any one subject will result in automatic firing. Meanwhile, the physical training and endless drilling will increasingly strain as well as strengthen their bodies; injuries that require too much downtime will also trigger automatic dismissal. With lives and property teetering on the edge, a firefighter cannot respond to a command by saying, "Oh, I failed that test," or "I missed practicing that skill because of a sprain." Up in his office, Capt. Jim Critchley makes somewhat different sense of all this rigor. "My goal," he says, "is not that they all survive this academy. It's that those who do graduate all survive to retire."

About a hundred firefighters die in the line of duty every year in the United States. The best way to better their odds is to train them well. Training scenarios can never quite be real, because firegrounds are true chaos, but the closer these recruits can come to realistic disasters, the better for them, for their partners and for us, the trusting public. It's this tried-and-true wisdom that makes this new campus, a firefighter's cross between Disneyland and a movie set, worth all the money.

Beyond the cavernous apparatus bay, housing three engines and an ambulance, curves an array of firefighting props including a fireable gas main, trenches and sewer pipes; a flammable liquid pool; burnable cars; a roof sitting on the ground; collapsible concrete floors; and the Burn Room, a squat concrete building that can become anything from a fiery car-cluttered garage with an apartment above to an empty warehouse. At the far end rises the six-story tower with a working elevator and rooms that can simulate offices, apartments, even a movie theater; artificial smoke can be pumped into any floor.

After a month of training, the captains decide the recruits are ready to enter a burning building. In the entryway to the Burn Room, the recruits seal themselves into their protective yellow Nomex suits called "turnouts" and Self-Contained Breathing Apparatuses, or SCBAs, which look like diver's tanks and make the wearer sound like Darth Vader. In the gloom, the reflective tape on their turnouts glimmers like the silvery trails of deep-sea animals. Four recruits sink to their knees along a charged hose line. Briefly, it looks like a prayer meeting, but then the iron door swings open, and following their captain, they crawl forward, dragging the hose with them into the darkness.

Hollywood likes to imagine firefighters bursting at a run into rooms draped with golden flame. In real life

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A captain (dark helmet) leads recruits into a burning room, hauling a hose line. They stay as low as possible to escape the worst heat.

they go into the dragon's throat on their hands and knees. Like some infernal wedding cake, trapped heat divides into well-defined layers. Down near the floor, the temperature in an average house fire may be a survivable 100 to 200 degrees Fahrenheit, but sit up and you may reach a searing 350 to 400 degrees, hot enough to melt your helmet's face shield in a few seconds. Stand up, and you may break into superheated gases pooling at the ceiling at around 1,200 to 1,300 degrees, plenty hot enough to ignite turnouts, which are fire-resistant, not fireproof. In this world, standing tall is not heroic but foolhardy: safety lurks near the ground.

In the Burn Room, the upper layers aren't allowed to get that hot. Nonetheless, with nearly 1,000 degrees at the ceiling and 350 at eye-level, it's plenty hot enough to feel the thermal layering. Through black haze, I can barely make out Capt. Scott Krause hovering six inches to my right; the bonfire I know to be as tall as I am masquerades as a distant, dull orange blob. Inside turnouts, the heat doesn't feel like heat; it feels more like an evil, pressing force relentlessly searching for a way to seep into my own private cosmos.

Captain Napier orders a recruit to send a burst of water toward the ceiling. Instantly, the water explodes into steam, knocking everyone to the floor as it expands in volume 1,700 times. The effect on the thermal layer cake has been roughly like sticking a mixer into it: what's left is a steamy, formless pudding. Though it's cooler on top, the lowest levels of the room are now a lot hotter. "What happened to those people you were trying to save?" Capt. Jim Critchley bellows. "If they were alive before, they sure aren't now. You've just boiled them like a bunch of lobsters!" Given half a chance, water will cross over to the enemy; don't use water any more than necessary, the recruits learn, and not at all until they're sure no one unprotected remains alive.

The day begins with an easy run to the beat of a jody, or rhyming chant, the favorites being the concoctions of Recruit John Vincent: "Can't make me quit, ain't no way, like stink on a monkey, I'm here to stay." Then it's time for "paying off towers," the most common penalty for mistakes large and small. Or, as Jeff Mayhew learns early, sprinting up six stories to the top of the tower, leaning out and yelling, "Sir, Recruit Mayhew, Sir!" and running back down, as many times as required.

Valve by hose section by hydrant, the recruits learn the basic tools of their trade, building up the complex maneuvers or "evolutions" at the heart of firefighting. Laying hose from water to fire, they reach into the engine to pull on a coil of hose so

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Recruits walk down into a suds-filled Burn Room, where visibility is zero. Some at first find the loss of vision overwhelming.

that it slithers to the ground, then hoist it onto a shoulder and run so that it spills behind in neat lines, ready for water. Working in full turnouts under an angry sun is like lifting weights in a sauna.

In the coolness of the classroom, the recruits learn theory. The nozzles class leaves a herd of algebraic equations describing water flow and friction loss trailing across the board. In the building construction class, they learn how all kinds of walls and roofs go up, so as to better understand how, and how fast, fire will make them fall down. EMT classes force-feed them anatomy, physiology, pathology and pharmacology. Ron Valencia, a big, bearish man who has dreamed of being a firefighter all his life, says: "It's a lot of studying, a *lot* of studying. But you have to get it right, or people die."

They also learn something corporate folks might call stress management. When I ask Capt. Alex Martinez what it looks like to go into a real fire, he says, "Close your eyes." For the recruits, the captains create more elaborate simulations. One morning, Jeff Mayhew and Linda Wekenborg don face masks blacked-out with tape, and the captains lead them deep into the Maze, an ingeniously variable labyrinth with a grid system built into its ceiling, allowing plywood walls to be slid into different patterns. As the recruits kneel at the nozzle end of a hose, Captain Thompson sets the scene: inside a big warehouse fire, Mayhew's alarm has just gone off, signaling that he has no more than five minutes of air left; lung-searing temperatures and poisonous gases mean that for firefighters, running out of air is equivalent to running out of life. "Got to get out, Sir!" cries Wekenborg. "Get out!" yells Captain Thompson, and the game is on. The means of escape is as old as Theseus' exit from the Minotaur's lair: having dragged a hose in, it is now the recruits' Braille trail out. I join the captains in making an unholy din, but Mayhew and Wekenborg ignore us, fumbling hand-over-hand along the line, bumping into furniture and walls but never letting go of the hose or each other. With only a few seconds to spare, they tumble out into open air.

Captain Martinez pushes Steve Ruetz and Ron Valencia through a similar scenario. At first they are fast and sure, but right near the door Ruetz unwittingly lets go of the hose leading out and picks up another. After a quick exchange, they turn and crawl back inside; Captain Martinez shakes his head but says nothing. When their five minutes are up, he calls, "Lie down, you're both dead."

The recruits' next acquaintance with disorientation is trial by foam. In the morning they learn the chemistry

Finally all the recruits make it through the suds and back out into the daylight, looking like they've been in a whipped-cream fight.

and physics of using foam to smother flammable liquid fires that water would only spread—jet fuel on runways, for instance—as well as fires in confined spaces too dangerous to enter, such as basements or tanker cars. When the captains fill the Burn Room to the ceiling with specialized suds, however, it's not to quench fire but to produce a suffocating atmosphere akin to a smoke-filled room. The first time the recruits descend into this lacy darkness, panic erupts at the bottom of the stairs and they scramble back up, retching and coughing. But the captains lead them relentlessly down again into the suds. In stubborn lines they trace their way around the walls until they reach the door and emerge like ragged snowmen. For the first time, they catch Captain Thompson cracking a smile.

The academy is an emotional roller coaster, and monthly inspections produce more strained faces, as Chief Moritz moves down taut rows of recruits, firing questions. Everything they've learned is fair game, from the care of axe heads to the problems of fighting combustible metal fires so hot they pull water molecules apart into hydrogen and oxygen, turning water into fuel.

The hardest of all the long, hard drills is decidedly old-fashioned: ladders. The recruits have to be able to raise and climb every ground ladder the department owns. Although the hydraulics of the ladder truck raise the 105-foot aerial ladder, the recruits have to clamber quickly to the top, hook themselves into the rungs with one leg and let go with both hands, ready to work. Most punishing of all are roof ladders, which have to be hauled up another ladder onto a roof and then pushed even farther, to hook over the roof's peak. One of Linda Wekenborg's finest moments comes when Captain Thompson watches her put up a ladder and says simply: "Good job."

Drilling continues, with a difference: now, says Mitzi Sloan, "it's not essentially 'How do I do this evolution?' You're asking 'How can I do this better?'" The scenarios grow more complex, from high-rise fires in the tower to car fires that must be approached from uphill and upwind to avoid gas tanks that are bombs and bumpers that are missiles poised to go airborne. Video footage of a firefighter in flames, tumbling down an aerial ladder, makes Sloan blanch and look away.

By mid-October, what was once a motley, bumbling crew is becoming a highly skilled, well-drilled unit. Rather than announcing their confidence, however, the captains show it: they put their lives into the hands of the recruits.

The prop called the Dragon simulates a gas main on fire; when it roars, flames shoot up 50 feet in huge

After graduation, the firefighters (they are no longer recruits) move a 1910 steamer back to the building where it is displayed.

orange balloons, and cyclones of fire spin off into the night. Suited up like yellow astronauts about to walk into the sun, Jeff Mayhew and his partner open their nozzles, and glittering cones of water lift hissing before them. A mere quarter-inch thick, this shield of water is all that stands between the recruits, their trusting captain and flash-roasting. Captain Napier puts a hand on each recruit's shoulder, and they strain toward the thundering tower of fire, the pressurized water driving the heat and flames before them. One bobble on the part of the recruits, and the fire will rush back to devour all three of them. As they reach the fire-breathing pipes, Captain Napier suddenly pitches forward as though to turn the valve at the base, shutting off the gas.

Not until they have backed into safety does the fire begin to die: up at the control booth, Engineer Dave Cox has finally turned down the gas. The valve at the main is a dummy, but there's nothing fake about that fire, and whoops of triumph clash in the night as the recruits shed their masks and airpacks.

The following week it's EMT practicals that make for a violent day at the academy. Brett Welander has become a bar-fight victim, his guts slipping through a slash across the belly; Linda Wekenborg lies moaning in a smashed car, white bone glistening from a gash in her thigh. Another recruit stretches unconscious with a bullet hole in his forehead, and still another spills blood from slashed wrists. K. D. Corcoran, the beloved EMT instructor who has taught Tucson's firefighters for more than a decade, has made up a few of the recruits with ghastly realism, to give their fellows a chance to practice responding to trauma.

Acting honors go to Recruit Andy Pashos, whose problem is not guns, knives or cars, but bees. His face and neck grotesquely swollen, he's wheezing and heaving as Ron Valencia and Bryce Womack arrive; calm and amused as ever, Paramedic Sharon McDonough calls out the effects of their actions, altering Andy's vital signs and symptoms according to what they do. Watching them, Capt. Max Parks tells me about his worst day at work, when despite all their efforts, his crew lost six people, including a young mother with an allergic reaction and a 5-year-old hit by a truck that plowed into his living room. "How do you go away from that day?" he says, still filled with disbelief. Paramedic McDonough talks about watching a little girl die after the glass table she was playing on shattered, slitting her throat. Parks shakes his head. "How do you tell these guys, Look, this is going to happen to you? We're not Supermen. You can't save everybody. People will

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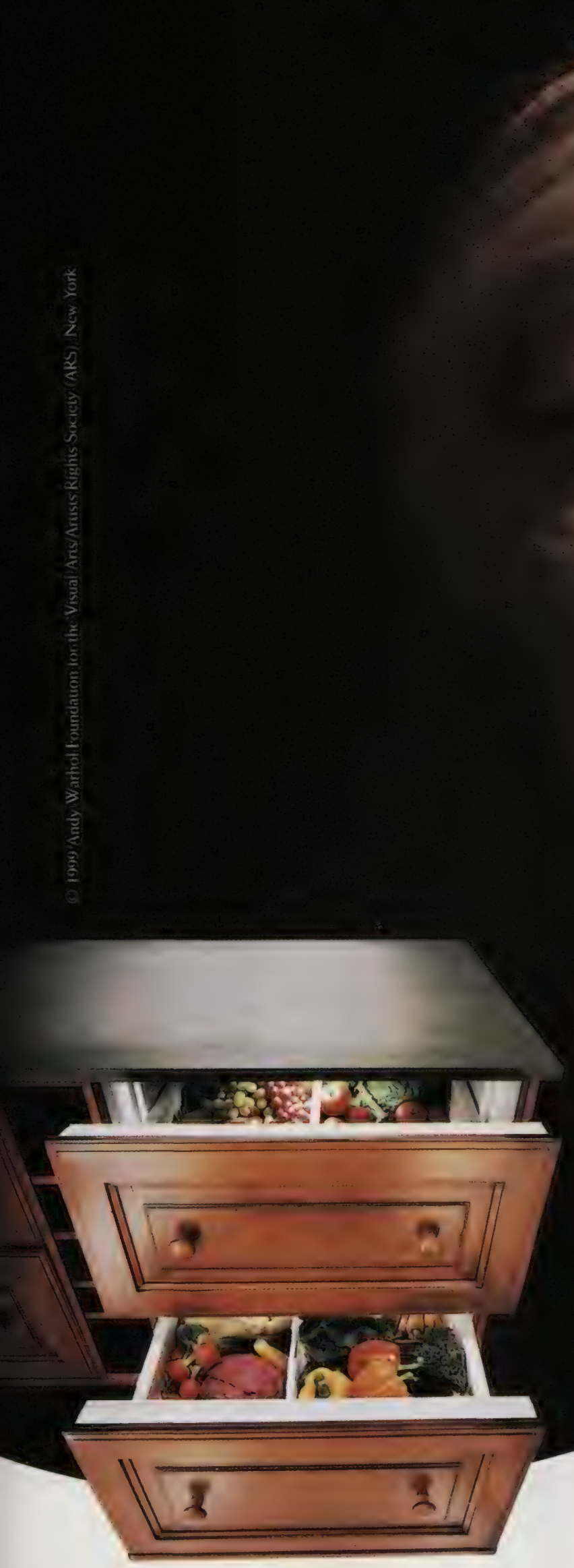

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die. But try hard. That's what this is all about: trying hard."

The graduation ceremony is impressive and emotional, as Chief Shipman tells the recruits that once out in the field they will do things that will make them laugh, see things that make them cry and witness events that shock them to the core. But every day, he says, "you're going to have the satisfaction of knowing that what you do makes a difference. There's no more honorable profession."

That night, at the party in the Union Hall, they finally cut loose, shoot some pool, dance, have a cigar and maybe even a beer. Casual greetings from captains startle them: "Hi, Bryce," says Jim Napier, and a wide-eyed Bryce Womack glances over his shoulder to check out the possibility that someone else with his name, a captain maybe, is standing nearby. All night the new firefighters pool and eddy in small groups, reliving their adventures with each other and the captains. They've been split up among Tucson's three fire shifts, one of which is always on duty. As a result, they will never all be together in one room again, until they have all retired. Recruit Bill Tylutki puts it into words, his brown eyes roaming the room: "It's hard to imagine not being with these people. It's the only thing that got you through, this group. Especially on bad days: you could take refuge in the group, and they'd pull you along, no matter how bad you were feeling or how bad you messed up."

Two days later, the new firefighters are out in the field. Steve Ruetz heads over to Station 8, one of the busiest in the country, under the command of Capt. Scott Krause. As the "boot," or junior member of the crew, it's Ruetz's job to clean, polish and nearly sterilize the station and its apparatus bay, make the coffee and do the shopping; he answers the phone in about half a ring.

Neither the studying nor the drilling is finished. As soon as the chores are done, Krause and the rest of the crew—Engineer Darrell Alexander and my brother, Bill Carrell—set Ruetz through familiar paces, laying hose, sliding quickly into his SCBA and putting up those inescapable ladders. They hurry to get through by lunchtime, because by traditional belief, it's the stroke of noon that ushers chaos into their corner of Tucson. Sure enough, at 12:03 there's a click, fluorescent lights glare and a sound like the trumpet of a lovesick electronic elephant fills the station house. "Engine 8; Medic 8," says the disembodied voice of the dispatcher, and we're off.

There's a click, fluorescent lights glare and a sound like the trumpet of a lovesick electronic elephant fills the station house. "Engine 8; Medic 8," says the voice.

Call after call, the engine wails down the street in a storm of whirling red-and-blue lights. I watch in wonder as we part seas of traffic, scattering everything from bicycles to semis, but Ruetz is busy pulling on gloves or strapping himself into his SCBA. We visit a scared and lonely old man, a young man who'd like morphine, a diabetic whose blood sugar soars after she's charged with shoplifting, and a brushfire ignited by tires exploding off a truck. At a freeway accident, Ruetz puts a bandage on a woman's finger while she proclaims she's not going to pay for any of this. Later, the crew gathers about the bedside of a woman dying of lung cancer, waiting for the ambulance that will take her on her last ride to the hospital. She's full of grace as well as fear, and as the ambulance doors close, she blows the crew a kiss.

A few days later, Ruetz is crawling into his first house fire. Despite everything he learned at the academy, the thick, claustrophobic darkness amazes him: he can't see *anything*. Right behind him, Bill leaves him no time for wonder, shouting: "Go on! Go on! Look for the glow." They bump forward until Ruetz sees a glimmer of orange, and then a golden line of flame rolls toward them across what turns out to be the surface of a burning bed. After they knock this fire down, Ruetz gradually realizes he's been baptized: he's really a firefighter now. As with every "first" for every boot across town, he'll be buying ice cream for the house.

In this first, Ruetz is fortunate, for there was no one in that bed, no shadow of death over this rite of passage. Bill Tylutki is not so lucky. On his first shift, he encounters the seared and cracked body of a man melted into his recliner.

Back at Station 8, I find Ruetz hunched over his books in the study. Then he smiles and wraps up his experience with two spiraling words: "anticipation" and "fulfillment." All the anticipation, he says, has finally arrived at fulfillment—only to stretch into anticipation again, as he and his classmates hurtle toward beautiful and terrifying experiences.

Click. The lights flick on, the alarm sounds. Amid reality at its messiest, the learning goes on . . .

Jennifer Lee Carrell last wrote for SMITHSONIAN *on the popularity of Shakespeare in the Wild West. Terrence Moore photographed the Mesa Verde story in our February issue.*

Caracol, Maya site, Cayo district. Photo by Tony Rath.

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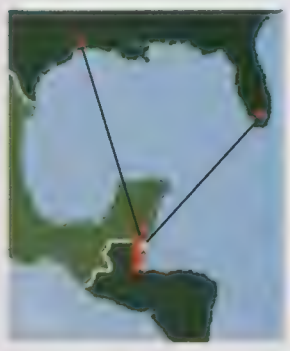

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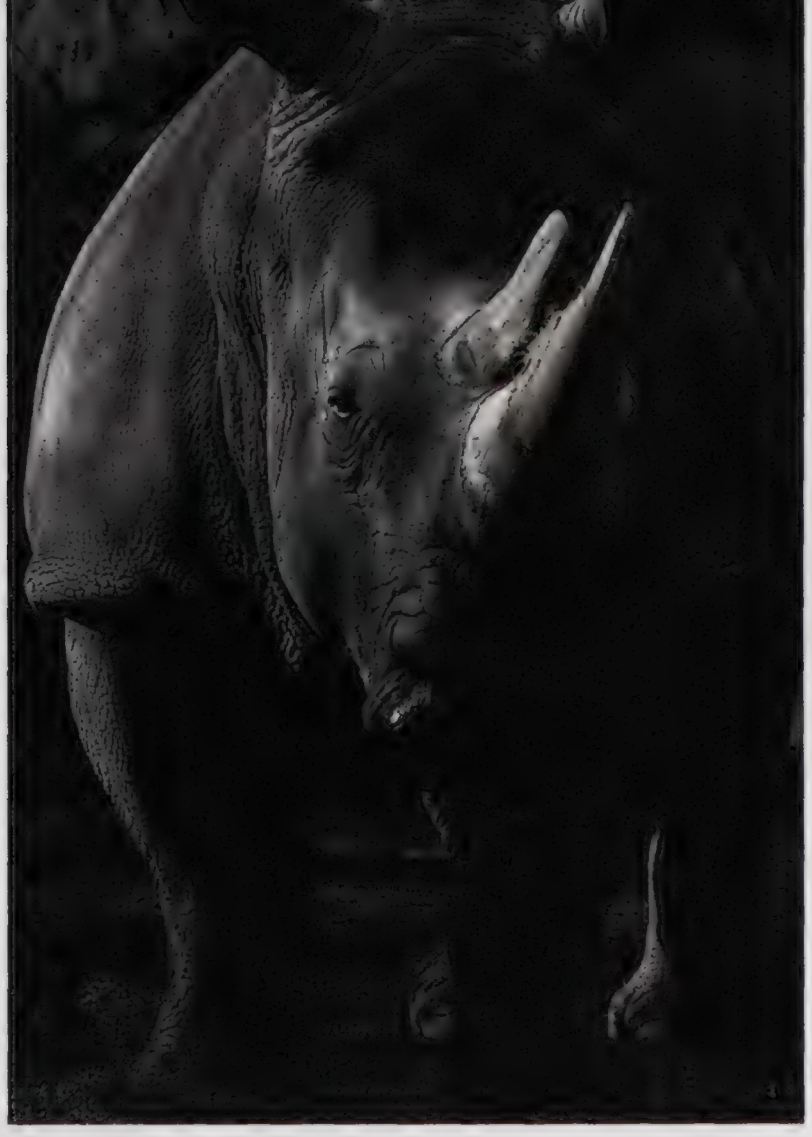


Its featherless pate suggests the foreboding visage of a vulture, but the vulturine guinea fowl (left) is neither vulture nor carrion eater, feeding mostly on plants and insects. Poaching in Central Africa reduced one subspecies of the white rhinoceros (above) to fewer than 25 individuals.

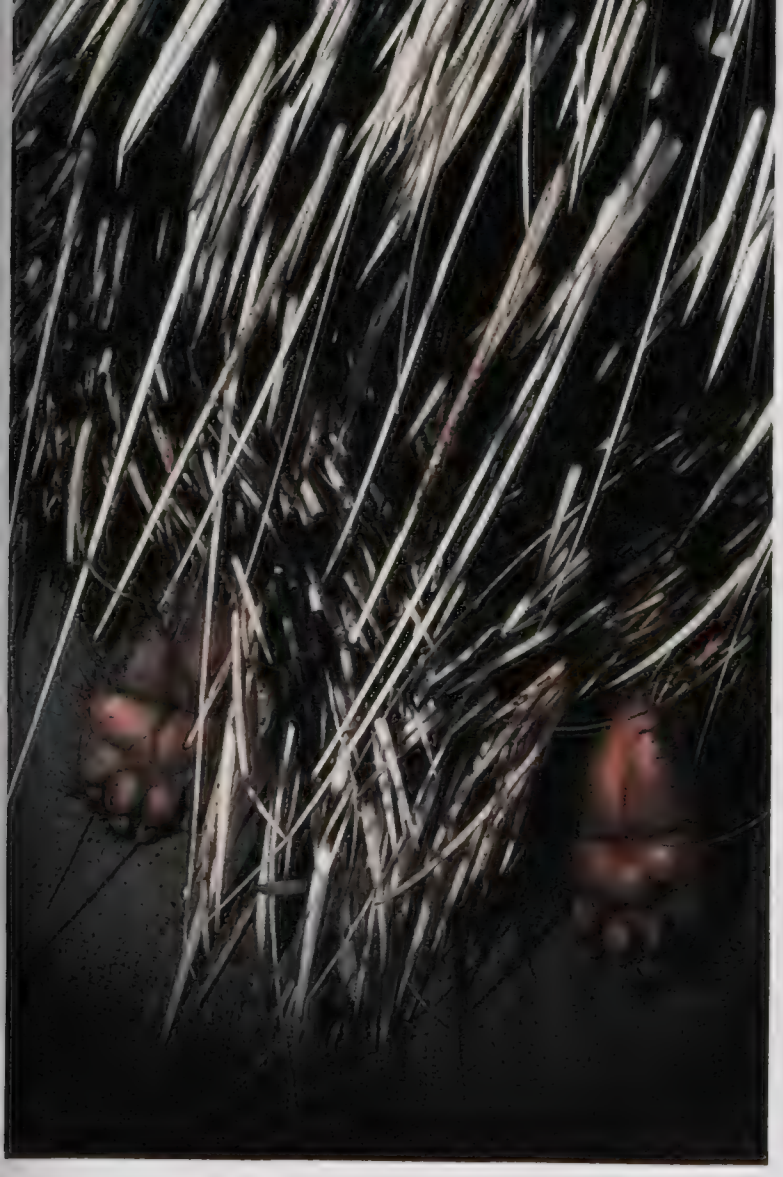
The Family of Animals

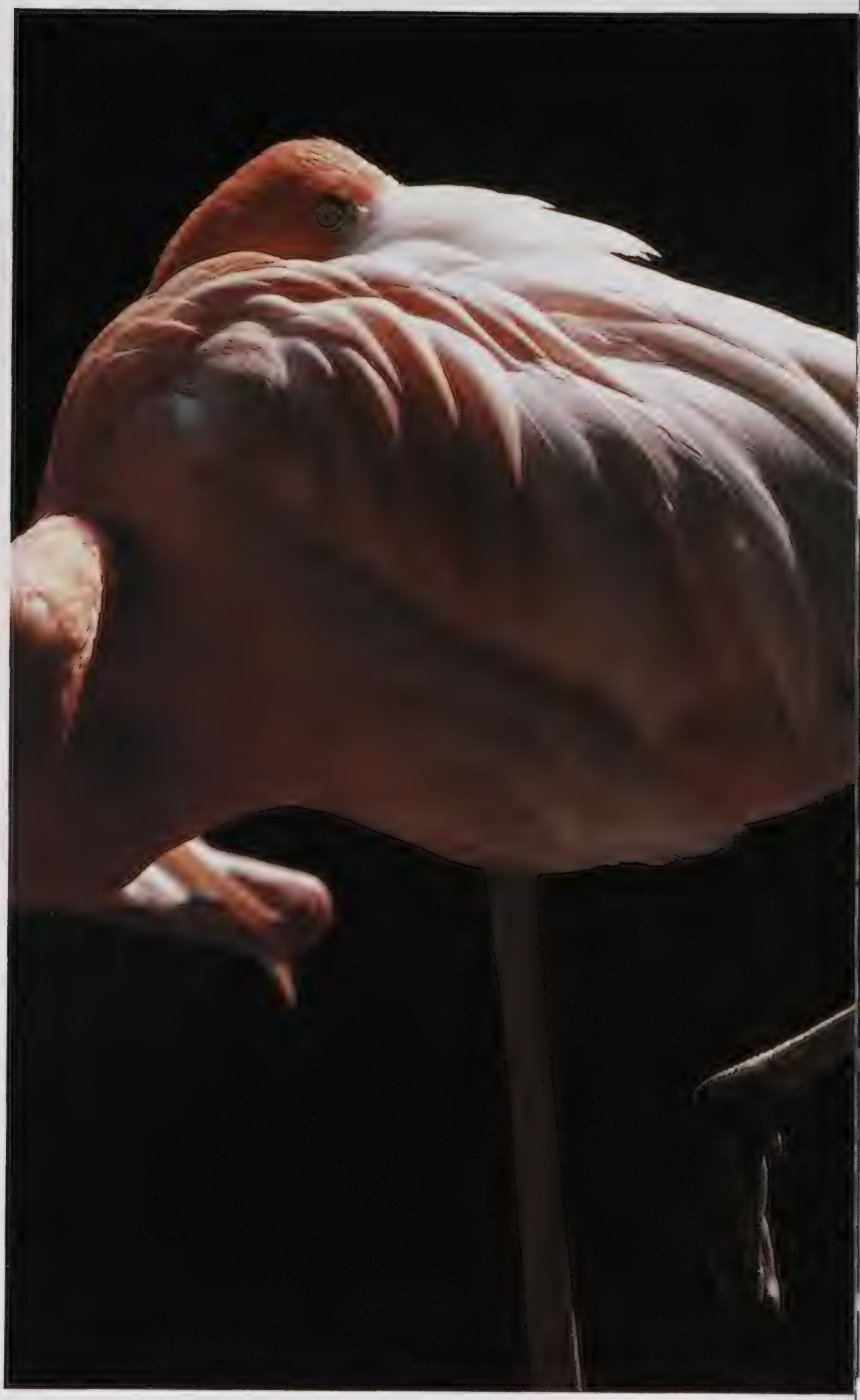
PHOTOGRAPHS BY NARUAKI ONISHI

IMAGES OF ANIMALS CROWD OUR DAILY VISUAL experience: a blur of burping frogs in television advertisements, cavorting sports mascots, singing bears in animated films, and children's rooms filled with small stuffed animals bearing silly names. More often than not, of course, these depictions reveal far more about human interests and foibles than about the qualities of animals. In these pages, Japanese photographer Naruaki Onishi presents us with a rare opportunity to view animals remarkably unburdened by this rampant anthropomorphism. These images come from his book *The Elephant's Ears*, the cumulation of ten years he spent painstakingly photographing animals in Japanese zoos. These are portraits of animals in repose, reflecting a serenity and solemn visage with which we can imagine our own portraits taken. Rarely do we have the chance to look wild animals in the eye; their rapid movement, and differences in height and vantage, and the difficulty of approaching or even finding them, preclude this view. Onishi captures the essence of that which draws us to zoos and to wild animals—the opportunity to stare into and think about the chasm separating humans from all other animals, as well as the bridges that join us. "If we feel an indescribable nostalgia for the images of animals," says Onishi, "it's because we may sense an existence of a common genetic code."

Musings about the interface between humans and animals have become increasingly consequential in a time when science has brought us a cloned sheep named Dolly, discoveries that the genetic differences between humans and chimpanzees are less than 2 percent, and strong evidence that we have contributed to the extinction of animals on this planet.

—John F. Ross





With habitats as diverse as the Arctic, the open prairie and the deep temperate forest, the red fox (left) boasts a wider natural distribution than any living terrestrial mammal aside from humans and the gray wolf. Widely distributed as well, the porcupine (above) repulses predators such as lions, leopards, hyenas and humans by raising its quills and charging backward, sometimes creating fatal wounds. Demand for porcupine quills as ornaments and talismans in Uganda and Singapore has decimated certain species. The American flamingo (right) derives its genus name, *Phoenicopterus,* from the Greek for "red winged," which in turn originates from the mythical red-winged phoenix. Indeed phoenixlike, the American flamingo has made a comeback in the West Indies, where flamingo populations had dwindled for well over a century.

Ancient Egyptians considered the dog-faced and aggressive hamadryas baboon (above) sacred, mummifying its body and portraying its image on temples and monoliths. Absent today from Egypt and much of its former range in Africa and Arabia, the hamadryas baboon travels in troops of about 100 individuals, coexisting by virtue of a highly developed social order. Centuries of domestication in Asia have protected the peacock (right), shown here in its albino form. More properly known as the common peafowl, the peacock became an early Christian symbol of immortality.

"HELLO BOYS!

Become an Erector Master Engineer!"

WITH NO "HANKY-PANKY GIMCRACKS," A. C. GILBERT'S ERECTOR SETS TAUGHT BOYS MORE THAN JUST THE NUTS AND BOLTS

BY BRUCE WATSON

THE UNITED STATES WAS DEEPLY INTO WORLD War I when a stumpy, athletic businessman entered the new, heavily guarded Navy Building in Washington, D.C. With him were several other men in suits, each carrying bulky packages. Guards searched the bundles and found nothing dangerous, just toys and some curious pieces of steel resembling tiny construction girders. The group was allowed to pass into the building. Entering the office of the Secretary of the Navy, they shook hands with him and the Secretaries of Commerce, War and the Interior. They had been convened to discuss toys and the nation's wartime priorities. Should parents be asked to support America's war effort by buying Liberty bonds instead of toys that Christmas, or should the Council of National Defense impose a ban on toy purchases? Beyond that another question loomed. Were toys vital to the nation's morale? The council had allot-

Whether used to build a rocket ship or carnival rides, Erector sets gave form to the dreams of millions of would-be engineers.

RICHARD WALKER; P.120 UPI/CORBIS-BETTMANN

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Another Gilbert Career-Building Science Set

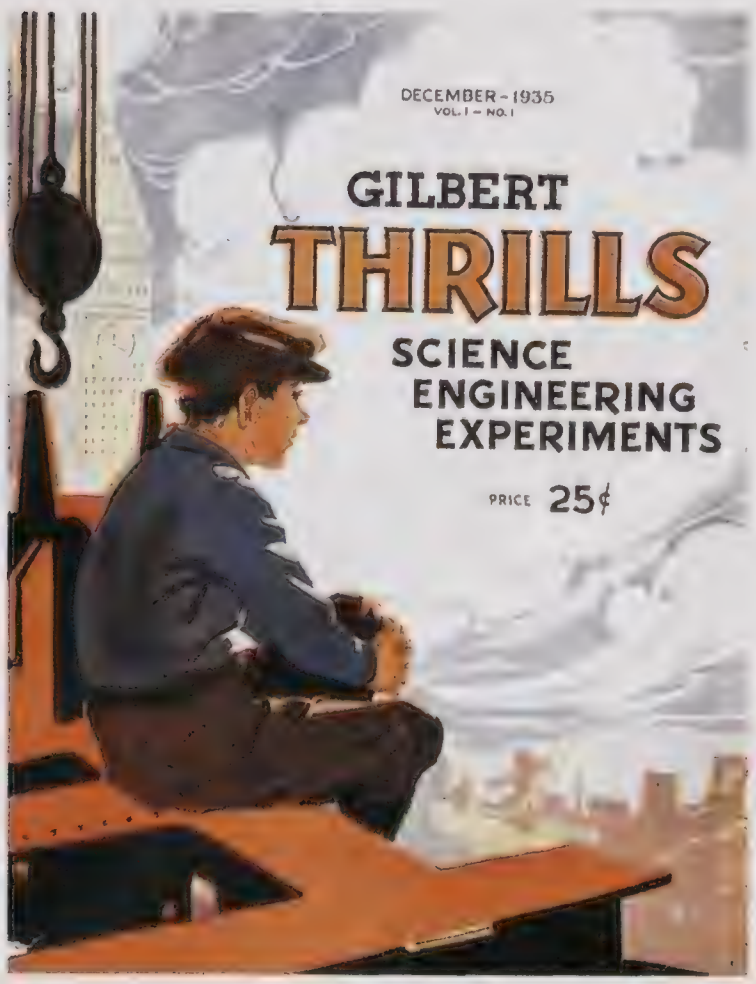
PARTS

ted less than a half hour to decide the fate of Christmas, but A. C. Gilbert had brought presents.

"The greatest influences in the life of a boy are his toys," Gilbert told the austere council. "The American boy is a genuine boy and he wants genuine toys." Toys, that is, like the ones he now began to unpack. Within a few minutes, the Secretary of the Navy was on the floor of his office playing with a toy submarine. The others quickly joined in. Tinkering with toy engines, assembling steel girders into bridges, the bureaucrats briefly became boys again.

As they played, the president of the A. C. Gilbert Company spoke about good clean fun and the importance of toys in building "solid American character." Yes, yes, but could someone please explain to the Secretary of Commerce how to start the steam engine. The Secretary of the Interior wanted to know more about a children's book on airplanes. And the Secretary of the Navy had several questions about his miniature sub.

A. C. Gilbert doles out sandwiches and smiles during the 1941 grand opening of the Gilbert Hall of Science in New York. Below: Gilbert issued this magazine-catalogue in 1935.



When the meeting finally ended, three hours later, the council decided against the ban on toys. The bureaucrats got to keep their presents—and A. C. Gilbert was hailed in the press as "the man who saved Christmas."

For generations of American boys, Alfred Carlton Gilbert saved much more than Christmas. He saved rainy afternoons from boredom. He saved inquiring minds (including mine) from the tedium of science textbooks. And like Peter Pan, he saved himself the trouble of growing up. An enterprising youth with a steely self-discipline, Gilbert drove himself to become a world-class athlete in a half dozen sports. Then, at play in the toy business he started, he made his greatest contribution to American boys (and probably a few girls), the Erector set. In the first Erector catalogue in 1913, Gilbert greeted future builders: "Hello Boys! Make Lots of Toys!" In the next half century, more than 30 million Erector sets were sold. But Gilbert also played in the fields of science, selling toy microscopes, telescopes, chemistry sets and do-it-yourself kits for studying everything from hydraulic engineering to nuclear physics. These days, when there seem to be more Nintendo game systems than trees, Gilbert's toys seem quaint and quiet. But ask a father or grandfather about his Erector set and watch the boy within surface with a smile. Nurturing childlike curiosity was A. C. Gilbert's aim, and few grown men have ever matched him for being all business while remaining all boy.

During more than 50 years in the toy trade, Gilbert based his products on a simple premise. He called it his "practical boy psychology." If he liked playing with trains and miniature steel girders, Gilbert figured, other boys would, too. Gilbert understood boys because he had been one in the all-American mold—rambunctious, competitive and happy. "I had the happiest boyhood of anybody I ever knew," he remembered with typical aplomb. "Nobody ever had so much fun, *good clean fun*, I mean." Doing magic tricks, running races, riding his Indian pony,

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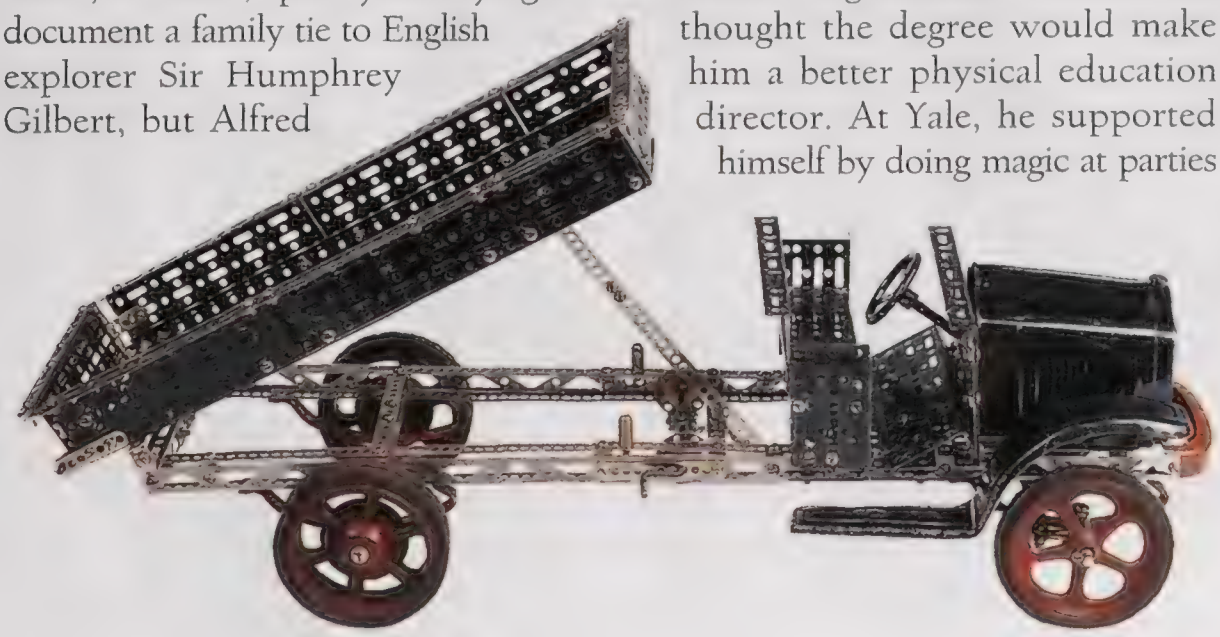
Gilbert seems to have grown up in the pages of a Boy Scout manual. Yet his actual playing fields were in Salem, Oregon, where he was born in 1884, and Moscow, Idaho, where the family moved when he was about 10. His father, a banker, spent years trying to document a family tie to English explorer Sir Humphrey Gilbert, but Alfred cared little for geography or any subject that required him to sit still.



As a boy, he started an athletic club in the barn, restricting membership to boys who helped him with his farm chores. Inside the barn, while other boys played, Gilbert did chin-ups until he dropped, climbed ropes and hammered a punching bag. At 7, he won a magic kit from a boys' magazine. When a traveling magician came to town a few years later, Gilbert impressed him with his sleight of hand, and when a minstrel show visited, Gilbert showed off on the punching bag, beating it with fists, elbows, shoulders and head. He was invited to join the show as the "Champion Boy Bag-Puncher of the World." He spent three days on the road before his father, who had already stopped his son from parachuting off their roof, tracked him down and brought him home.

At 16, Gilbert entered a preparatory school at Pacific University, a small Oregon college, and then enrolled at the college itself. There he quarterbacked the football team and won more than a hundred athletic trophies and ribbons. The Portland *Oregonian* reported that Gilbert's feat of 40 consecutive chin-ups broke the "World's Chinning Record." During summers, he worked on farms to earn tuition to Yale Medical School, where he enrolled in 1904. He had no intention of becoming a doctor, however; he thought the degree would make him a better physical education director. At Yale, he supported himself by doing magic at parties and clubs, earning as much as $100 a night. Standing just five feet seven inches, and weighing 135 pounds, he was discouraged from trying out for Ivy League football, so he turned his competitive energy to the pole vault and revolutionized the event. Vaulters were then using heavy ash or hickory poles with spikes that they drove into the ground just before taking off. No one had ever cleared a bar higher than 12 feet.

Gilbert had taught himself to vault in Oregon using a shaved-down fence rail and an early form of a "vaulting box," a small hollow at the end of the runway that anchors the pole during vaulting. At Yale, he favored a lightweight, spikeless bamboo pole and, using his primitive vaulting box, set the world record of 12 feet, three inches. In 1908 he broke his record at the Olympic trials and went to the London games vowing to clear 13 feet.

Gilbert could later joke about being the "hatchet man" of the Olympics, but when British judges would not let him use his system, he was furious. Before his first vault, he hid a hatchet in his sweater. When no one was looking, he calmly walked to the

A. C. Gilbert often said that he had put together more bolts and nuts than any man alive.

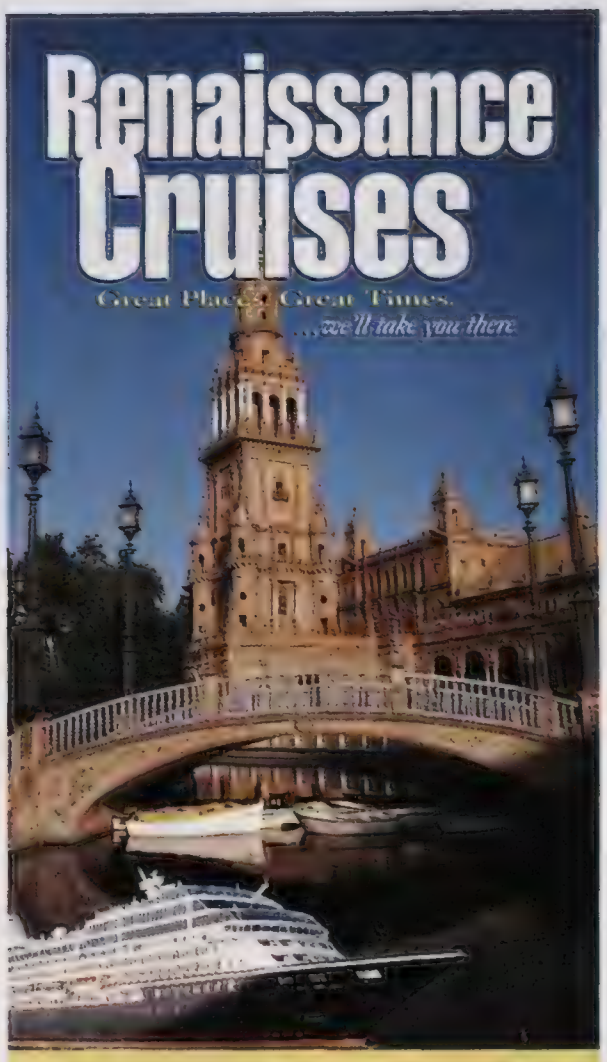
crossbar and began hacking a hole in the dirt. Bobbies soon led him off the field. Despite his protests, Gilbert was forced to use a spiked pole. He won the event anyway, but just as he was preparing to receive his medal, the judges revealed that another vaulter, who had done poorly in the finals, had actually cleared a higher bar in the preliminaries. The judges gave Gilbert a chance to match the other vaulter's mark. He did, but to Gilbert's astonishment, the judges forced him to share the gold. Decades later, Gilbert still fumed. "Damn it, that's the only time in history that a man was ever allowed to make a record in a heat!" he said. "I always say that I won the Olympics and I don't think anybody who knows the facts will deny that I'm right!"

Home from the Olympics, Gilbert was invited to the summer residence of his hero, President Theodore Roosevelt. By the end of the next year, he'd cleared 13 feet, two inches. Yale professors had been urging him to study surgery, saying his talented hands were "surgeon's hands," but Gilbert was having too much fun. "I have never worked at anything to make money unless it was fun, too," he later noted. During his senior year at Yale, he and a friend started a company to make and sell simple magic tricks. After getting his medical degree, Gilbert, recently married, expanded his Mysto Manufacturing Company, performing and selling his tricks all over the country. But mere magic couldn't earn him a living. He needed a magical idea.

One fall afternoon in 1911, he recalls in his autobiography, he was riding the train between New Haven and New York. Glancing out the window, he studied cranes erecting a latticework of girders near the tracks. What if he could make a toy construction set? he thought. Back home that evening, Gilbert and his wife, Mary, cut the first Erector set out of cardboard, carefully notching miniature girders of assorted shapes and sizes. Gilbert took the prototype to a machinist who turned it into steel. When his partner thought the toy a mere trifle, Gilbert borrowed money from his father and bought Mysto Manufacturing for himself. For the next two years, he alternated days as a businessman with nights as a boy. Staying up late, he tinkered with girders to design Aeroplanes, Windmills and other models for the first Erector manual. He often said he had put together more bolts and nuts than any

Model trains came with this No. 10½ Erector set (below) and others after Gilbert bought American Flyer Trains in 1938. Left: The 1926 No. 7½ Dump Truck.

RICHARD WALKER



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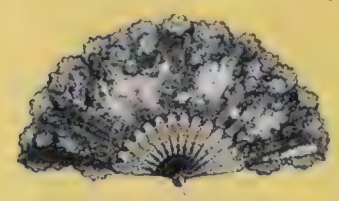

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man alive. In 1913, the "Erector Structural Steel & Electro-Mechanical Builder" sets hit the market.

In today's toy-glutted world, it's hard to imagine the impact of the simple Erector set. The toys of 1913 tended to treat their owners as mere kids. Windup dolls, jack-in-the-boxes, tops—each was a one-trick pony. Push a button, turn a crank and the plaything played for you. Gilbert scoffed at such "hanky-panky gimcracks." His Erector set treated boys as if they would someday become men of industry and had better start training now. Advertisements and manuals featured personal messages from the inventor of Erector. "Hello Boys," they often began. In a December 1916 advertisement in the *American Boy* magazine, Gilbert wrote, "No other toy will give you the big fun that Erector will give you. You can reproduce in miniature, with all the Erector parts, all of the big engineering feats such as Panama Canal Locks, the Brooklyn Bridge, and the Eiffel Tower of Paris. There is no limit to your fun!" For several years, British children had played with another construction set called Meccano, but before it could take hold on these shores, Gilbert had purchased an old carriage factory in New Haven to keep up with orders for Erector.

In 1916, Gilbert changed his company's name from Mysto Manufacturing to A. C. Gilbert. By then, boys were building lots of toys, and Erector sets priced from $1 to $25 were grossing a million dollars a year. Gilbert's ads—one of the first nationwide toy campaigns—spoke to parents as much as to their sons. In the *Ladies' Home Journal* he told mothers, "I believe I have solved the boy problem!" Playing with Erector sets, he explained, appeals to boys' imagination and "awakens and develops the constructive side of their nature." To entice boys themselves, he used avuncular advice. "If I were a boy," Gilbert

Vapor trails of radioactive particles fascinate a budding nuclear engineer tinkering with the cloud chamber of Gilbert's No. U-238 Atomic Energy Lab.

wrote in one catalogue, "I would save my nickels and dimes and buy the set with the motor."

Gilbert knew that young builders wanted more than a set of blueprints; they wanted recognition. Soon, the Gilbert Institute of Erector Engineering, an institute on paper only, awarded boys degrees as "Engineer" and "Master Engineer." Red-blooded boys thrived on competition, so Gilbert conducted Erector design contests, offering canoes and ponies as prizes—for designs he could later market in his Erector manuals. And proud owners could subscribe to Gilbert's "lively boys' magazine," *Erector Tips*, to learn about new models and receive paternal guidance.

Gilbert soon added a chemistry set to his line and began promoting his products with childlike exuberance. Over the years, he steadily expanded his business, adding science kits with names both homey and high-tech: "Magnetic Fun and Facts," "Hydraulic and Pneumatic Engineering" and the "Weather Bureau." His company had long manufactured household items, too, including blenders, portable fans and hair dryers—to keep his factory busy in the months after Christmas. Gilbert himself eventually earned more than 180 patents for motors, gearboxes and appliances. But the flagship of the A. C. Gilbert Company was always its trusty little Erector set, which contained the very building blocks of the industrial age.

As fathers and grandfathers remember, even a modest Erector set was the heaviest box under the Christmas tree. And when it was opened, parents often didn't see their sons until dinner. The Erector set demanded a surgeon's dexterity and a machinist's eye for detail. I recall its frustrations well. Whether I was cranking out some wimpy Grocery Wagon or laboring all day over the Jet Bomber, Erector's manual offered little help—at least in the small set I had as a child. The larger sets had elaborate

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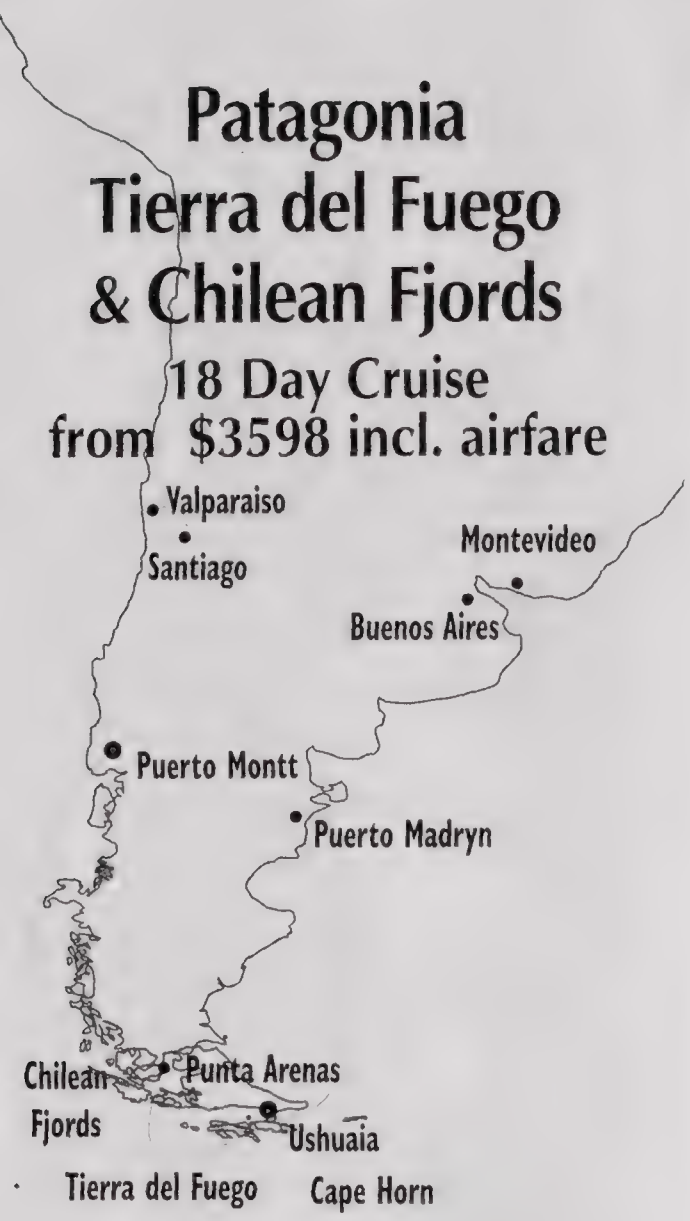

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instructions, but the only guidelines I had were drawings of each model. We low-end Erector Engineers had to study the sketches, dig through a pile of parts to find pieces, then assemble them with nuts and bolts smaller than any we have seen since. Few of my finished models resembled their blueprints. My Windmill looked like a steel magnolia, my Unloading Crane more like the feathered cranes found fishing in rivers than denizens of a construction site. I couldn't have been the only boy to send my Revolving Dock Hoist flying across the room in a fit. Yet for a rainy day, there was nothing like an Erector set. Or as Gilbert himself advertised, "Erector is the kind of play all bright boys like."

Like the gears packed in Erector's wooden boxes, Gilbert's early models meshed neatly with an era of milk trucks and Model Ts. Seated on living room floors, boys built pint-size Lumber Trucks and Vegetable Carts. Costlier sets let you build Draw Bridges and Merry-Go-Rounds powered by a nifty electric motor, "the motor with a punch." But in the 1920s, as more and more skyscrapers punctuated urban skylines, Gilbert brought Erector up to speed, slimming the girders from an inch to a half-inch wide. He also began offering the keenest Erector sets ever, the most splendiferous being the "No. 10," which Gilbert continued to upgrade with new features each year. Described in the 1931 catalogue as the "Climax of Erector Glory," the No. 10's two-volume instruction booklet that year showed boys how to build Ferris Wheels four feet in diameter, a Hudson Locomotive and Tender, and a five-foot Zeppelin with a cloth bag fitted to its frame. There seemed no limit to what the hundred-odd pounds of steel in the No. 10 could build. At a time when a solid-oak, rolltop desk could be bought for $25, Erector's top of the line, at $69.75, cost a fortune. Bigger toys attracted bigger

Hunting trophies crowd A. C. Gilbert's log cabin at Paradise, his 600-acre estate and game preserve in the woods of southern Connecticut, outside New Haven.

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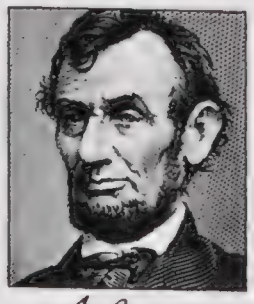

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New York's Gilbert Hall of Science featured huge dioramas crisscrossed by American Flyer trains.

boys, however, so Gilbert expanded his contests, with categories for different age groups and more elaborate prizes. During the Depression, the winner received $500, a car, or a trip to see any scientific project in the nation. One winning engineer took the money and applied it to his tuition at MIT.

Gilbert had three children of his own, and he couldn't pass up the chance to play paterfamilias to America's youth, making the Erector name synonymous with wholesome fun. During the 1920s, the Gilbert Circus Car, a full-size train car packed with his toys and appliances, toured the country. In 1928, he hosted one of radio's first nationally broadcast sports talk shows, interviewing Babe Ruth and other heroes. Later, he opened the Gilbert Hall of Science catercorner from the Flatiron Building on Fifth Avenue in Manhattan. Dedicated "to the youth of America," the hall, part museum, part sales floor, featured huge dioramas crisscrossed by American Flyer trains, whose business Gilbert bought during the Depression. On the floor, men and boys discussed "structural steel engineering" and "scale-model railroading."

While Gilbert encouraged young minds, he was also concerned with physical fitness. "Whatever success I have had in life I lay in a big share to the fact that I have always kept myself in first-class physical condition," Gilbert once wrote. "A boy's brain works a whole lot better, much clearer and more thorough, if his body is in good shape."

Gilbert didn't just preach; he practiced. Even in his 50s, his daily regimen began at 6 A.M. with a quick jog, then a workout with Indian clubs, plus punching a bag and lifting weights. Arriving at his factory by

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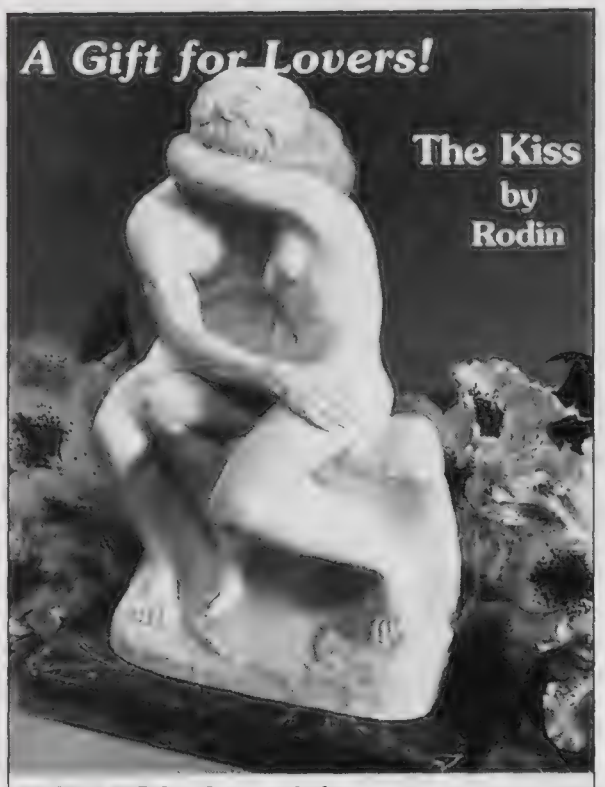

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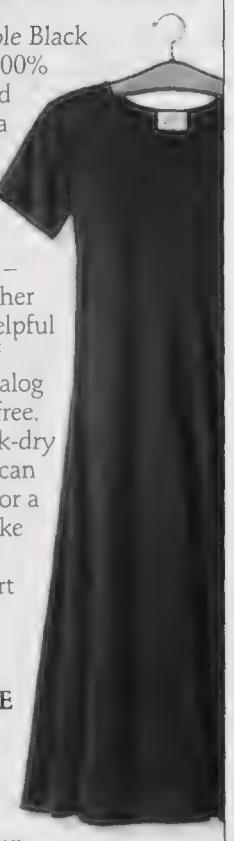

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7:30, usually dressed in a gabardine suit, he punched the clock along with the rest of his employees. His cluttered office usually included a train set on the floor and an Erector model in progress on a table. And in slow moments, the president of the A. C. Gilbert Company would jog out of his office, chin himself several times on a bar, then jog back to his desk.

"Dear Mr. Giblet," began one of the nearly 300,000 letters that Gilbert received each year.

Constantly driving himself, and earning an ulcer in the process, he continued to practice, and champion, competition. He helped coach U.S. Olympic teams, trained pole vaulters and wrote the *Encyclopaedia Britannica*'s article on the event. Whatever he did, he did to win.

To adults, Gilbert may have seemed pretentious, but to boys, he was, as he signed his public missives, "Your friend, A. C. Gilbert." And boys, whether fresh-faced Andy Hardys or inventive Tom Swifts, wrote their friend nearly 300,000 letters a year. Some of them could barely write, but they had a question that just had to be written. "Dear Mr. Giblet," one wrote. "I wonder could you give me a idea where I can get a book on forward passing and receving. I am not very good on the receving. I can't keep aholt of it." Thousands of letters came from boys too young to capitalize the first person pronoun. Gilbert called these his "little i" letters. Many were signed "your loving son." As his first generation of boy scientists grew up, Gilbert boasted of their accomplishments. "I thought you might be interested in knowing what happened to one of the kids who 'cut his teeth' on a Gilbert Chemistry Set," read a

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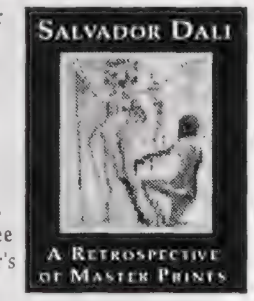

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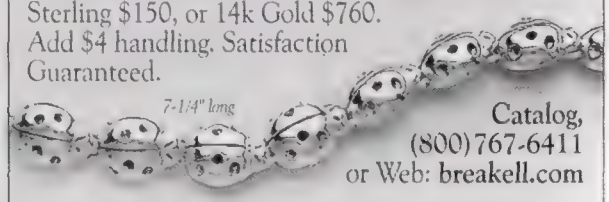

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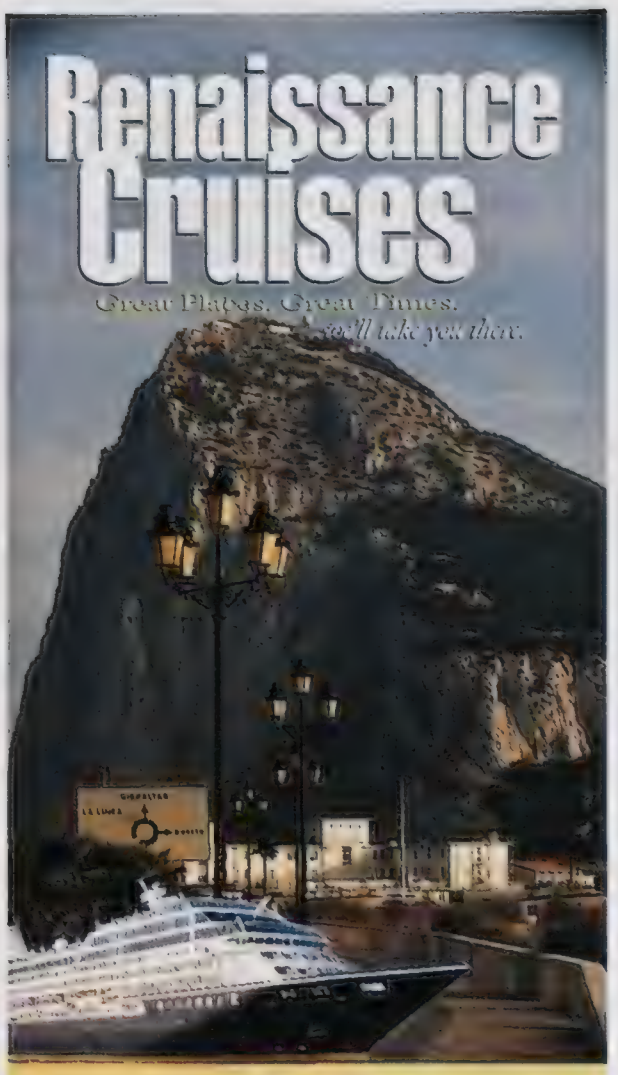
fan letter he often cited, "so I am enclosing a reprint of a paper titled 'Determination of Oxygen in Titanium,' which I presented at the last meeting of the American Chemical Society." During World War II, Gilbert was pleased to learn that the original scale model for the Army's portable Bailey bridge, considered an engineering marvel, had been built using an Erector set.

If Gilbert did a lot for kids, kids did a lot for Gilbert. They made him a multimillionaire living out a boy's fantasy on a 600-acre Connecticut estate he called Paradise. The place had 30 miles of hiking trails, a full game reserve stocked with pheasant, a lake full of rainbow trout, and a herd of white-tailed deer, which he thinned each year. He frequently hunted in Alaska, bagging bear, elk and moose whose heads filled the six-bedroom hunting lodge at Paradise. But all his athletic and hunting trophies couldn't put Gilbert at rest. Back home, after working at his factory each morning, he spent afternoons restlessly roaming his estate. "Why, he hasn't sat still five minutes since he was a baby," his wife remarked. "He's always doing something—sometimes several things at once. It's very exciting to be Alfred, you know."

Throughout the 1930s and '40s, Fridays were a special day in New Haven's "Erector Square." In the factory lunchroom, it was not unusual to see the company president step onto a small stage. There, with much

More than 400 Erector sets pack Bill Bean's Ohio basement. His collection spans a half century of Gilbert toys, and includes this rare 1931 Hudson Locomotive.

RICHARD WALKER



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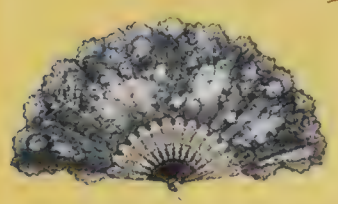

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Now valuable collectibles, old No. 10 Erector sets can fetch between $7,000 and $15,000 apiece.

fanfare, Gilbert entertained his workers, pulling rabbits out of hats. Then, while workers in other factories were going back to work, Gilbert introduced an orchestra and encouraged dancing. Movies were often shown, and on the birthdays of longtime employees, Gilbert would meet with those workers personally, shaking hands with men, giving women corsages. While other factories were unionizing, Gilbert prided himself on his labor relations without a union. He paid his 2,500 "co-workers" higher than average factory wages, and offered them free medical and legal consulting, and frequent personal contact. Each week, Gilbert walked through his factory, talking about toys and chatting with employees on a first-name basis. But like such courtly customs, the A. C. Gilbert Company remained rooted in the past.

In the 1950s, Gilbert updated Erector again, adding Mysterious Walking Robots and Rocket Launchers. Science, however, was no longer as innocent as it had been in Gilbert's boyhood. In 1950, Gilbert released a No. U-238 Atomic Energy Lab. The kit came with its own Geiger counter, cloud chamber and small disks emitting genuine radioactive particles. "With its instruments," the catalogue said, "you can study and UNDERSTAND the atom. . . . " Columbia University bought five kits for its physics lab, but the atomic set never sold well. Parents didn't take to the idea. Erector sets remained the toy of choice for boy builders, but their inventor was slowing down at last. He shook hands with employees less often, and spoke of being "an athlete who goes stale." Gilbert retired in 1954, turning the company over to his son, Alfred, Jr. Gradually, he sold portions of Paradise, including his herd of deer.

In 1961, Gilbert died at age 76. The company he had run as his personal toy empire outlasted him by just six years. Despite updates of the more expensive models, Erector's basic design had changed little since the 1920s. In an age of hula hoops and Silly Putty, boys no longer wanted to build lots of toys. Besides, what was a Vegetable Cart anyway? The A. C. Gilbert Company folded in 1967. Countless Erector sets ended up in attics, and the trademarked name was ultimately sold to its old competition, the Meccano Company, which had since moved its headquarters to

France—and which still markets small kits that make one model apiece. Boys who became men forgot all about their Erector sets. Then, in the 1980s, as baseball cards and Pez dispensers became collectibles, they remembered.

About 15 years ago, while visiting a flea market near his hometown of Dayton, Ohio, Bill Bean stumbled across an old Erector set. "Waves and waves of nostalgia came back," Bean recalled. The tiny gears and girders took him back 30 years, to Christmas in 1955 when he was 8. "On Christmas, after I opened my first Erector set, my grandfather came over," Bean told me. "He and my dad decided to build the Parachute Jump, the biggest thing in the book. I kept saying they should start with something simple like the Flatbed Truck. That's what Mr. Gilbert recommended in the manual. But they took over the set. They spent hours and built about 18 inches of the six-foot-high model. They stopped there. I took it down a month later. But whenever I opened my set, there it was, everything neat, shiny and ordered. I just wanted to get in there and build."

Bean began investigating the company whose simple set of chemicals and beakers had inspired him to earn a bachelor's degree in chemistry. At other flea markets, he bought several Erector sets and began stockpiling spare parts. He put ads in collectors' magazines. The hobby became an obsession, and now Bean's basement is filled with more than 400 Erector sets from the first series in 1913 to some of the last sets of the 1960s. Flip a switch beneath the Parachute Jump and the chutes drop gently to the ground. Turn a crank and the Merry-Go-Round whirls. In one corner I found an example of my own set, packaged in a cardboard tube and sold in the late 1950s. Elsewhere, zeppelins, trains and whole shelves of science kits make Bean's basement an unofficial Gilbert museum.

Bean is quick to note that he is "not a builder." Instead of assembling models, he assembles the kits themselves. "Most collectors can't sleep until we know a set is complete," he admitted. Last July, in Huntsville, Alabama, Bean was the keynote speaker at the annual convention of the A. C. Gilbert Heritage Society. Founded in 1991, the society now has some 350 members who gather each summer to share their interest in "structural steel engineering." Bean has written a two-volume book minutely detailing every set Gilbert ever made, and listing their current values. Old Erector sets can be found

for $10 to $50, Bean said, but others cost a good deal more. Old No. 10 sets, still in all their glory, go for $7,000 to $15,000. Erector collectors are eager to pay the price. The group includes a few women, but Erector sets hold little interest for today's girls—or boys.

"It's a toy whose time has come and gone," Bean says. "Erector sets come from a time when things were slower, when kids didn't have the excitement level they do today." Still, roaming through Bean's basement, you can feel the raw curiosity A. C. Gilbert packaged in metal, wooden and cardboard cases. Each set, from the early ones with tiny pulleys to the later ones with miniature rockets, seems like boyhood in a box. And while Gilbert's paternal advice is dated, his enthusiasm remains fresh. "Hello Boys!" he shouts from an ad hung on Bean's wall. "Become an Erector Master Engineer!"

Toys and the world they model change with time. Steel girders may surrender to fiberglass. Gears give way to silicon chips. Yet the fun of building is timeless. In Salem, Oregon, A. C. Gilbert's boyhood home is now a children's museum offering science classes, nature walks and hands-on displays. It's a fitting tribute to the man who not only saved Christmas but turned millions of boys into builders, if only for rainy afternoons. "What with the trains and everything else," Gilbert once said, "I've built an empire. True, it's a toy empire." As he approached retirement, he looked back on the road that took him from Oregon to Paradise. "I guess my life hasn't been anything to set the world on fire," he said, "but it's been interesting, and I know this: I've had more fun than the average boy."

While digging into the life of A. C. Gilbert, frequent contributor Bruce Watson bought an old Erector set. He found it too frustrating, and it now lies in pieces in his attic.

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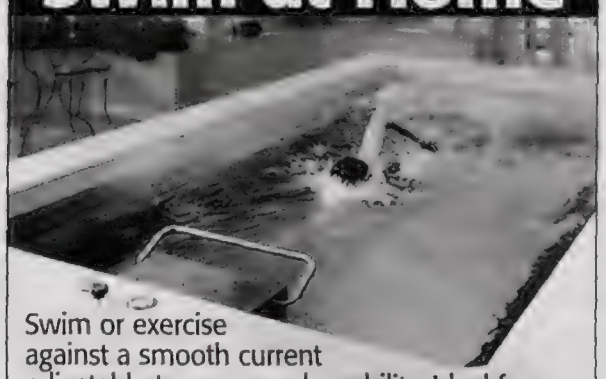

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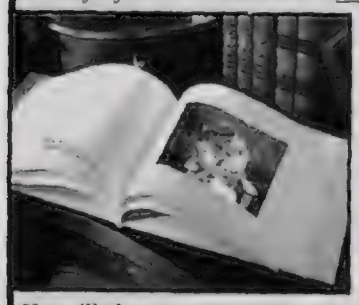

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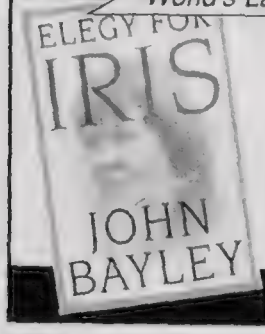

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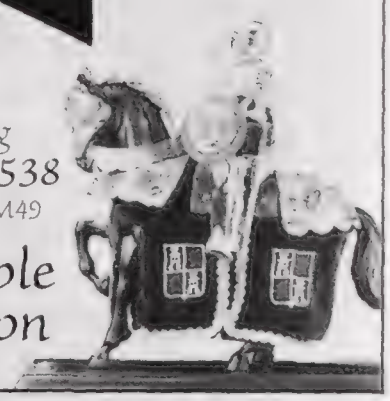

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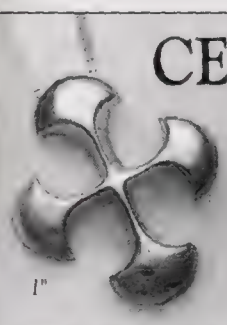
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BOOK REVIEWS

The Cambridge Quintet

John L. Casti

Perseus Books, $23

A Beautiful Mind

Sylvia Nasar

Simon & Schuster, $25

AFTER NEARLY HALF A CENTURY OF living with computers, quite rational people still argue about whether such machines can really think. Two people can look at the same computer and where one sees artificial intelligence, the other sees a mindless embodiment of logical rules. The same two observers, of course, might very well disagree about another human being's state of mind, one seeing a madman where the other sees a visionary or a prophet.

At the heart of such differences lie our deepest beliefs, and fears, about the nature of intelligence, rationality and the human mind. Two recent books explore such issues, one as a matter of pure reason, the other as a story of genius, insanity and love. John Casti's *The Cambridge Quintet* is a brilliant literary invention and intellectual feast. It is the account of an imagined dinner party at Cambridge University just after World War II, hosted by the famed writer C. P. Snow to pick the brains of other great minds about the prospects of actually constructing a "thinking machine." The guests are mathematician Alan Turing, who did pioneering work on such a project, along with biologist J.B.S. Haldane, quantum physicist Erwin Schrödinger and philosopher Ludwig Wittgenstein.

The chapters of the book are divided into the various courses of the meal: the sherry, the soup, the fish

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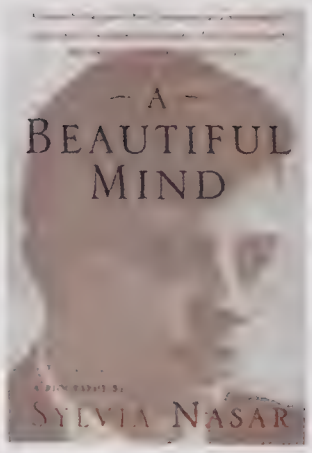

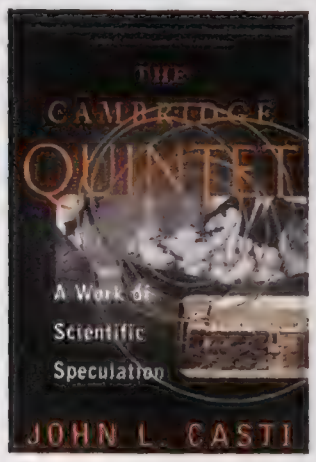

and so on. And the conversation is as rich as the menu. As the guests argue for and against the possibility of a thinking machine, the eavesdropping reader gets a deliciously clear and engaging account of the problem. Turing explains lucidly how, by manipulating the symbols 0 and 1, a machine can perform logical operations; and how this is analogous to the brain, where each individual neuron is switched ON or OFF by its stimuli. "Moreover," Schrödinger offers, "both the computer and the brain process these data into patterns. Is that the analogy you're pursuing, Turing?"

"Precisely," Turing replies. "The brain stores its data in the form of patterns created by the firing of its neurons. Each such pattern is just a listing of which neurons are ON and which are OFF at any given moment. These patterns are then associated with what we call 'thoughts' in ways that no one yet really understands." Brushing aside his own caveat—that all this occurs in a manner that hasn't yet been elucidated—Turing holds that "intelligence is just a matter of following the right kind of rules." Several generations of scientists have followed him down this path.

At Snow's dinner, however, it is Wittgenstein, the philosopher of language, who points to the flaw in Turing's reasoning. A pattern of symbols, or language, has no meaning, he says, apart from the shared experience of people using those symbols. "To have language is to have a way of life," he insists. "Everything we say is totally bound up with what we do."

Whether the essence of language is syntax (the rules) or semantics (the meaning) continues to divide linguists as well as computer scientists and philosophers, but Casti's dinner debate is as clear as it is entertaining. Because Turing and his heirs define human thinking in abstract, mechanical terms, they believe machines can think. For Wittgenstein and his heirs, thinking follows the experience of life, not just the rules of logic, and machines have it not.

Perhaps, Casti concludes, the answer will lie in a divergence we can only guess at. "This half a century of research," he observes, "has shown that these are two distinct forms of intelligence, and that for a short period they will peacefully coexist. After the current, but brief interregnum, machines and humans will go their separate ways, much as humans and dolphins parted company many millennia ago."

For Wittgenstein and his heirs, thinking follows the experience of life, not just the rules of logic, and machines have it not.

In Sylvia Nasar's *A Beautiful Mind*, the experience of life and the rules of logic collide head on. In this strange and deeply moving biography, the young mathematical genius John Nash, "inventor of a theory of rational behavior" and "visionary of the thinking machine," loses his mind to schizophrenia—yet decades later reawakens to win a Nobel Prize for his earlier work and take up his own mathematical investigations again.

Nasar traces Nash's youthful ascendancy as a mathematician, as he turns

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his attention to the geometry of imaginary spaces and the mystery of prime numbers, and the work that won a Nobel, on the theory of games. "Nash's faith in rationality and the power of pure thought was extreme," she writes. "Einstein once chided him for wishing to amend relativity theory without studying physics."

But Nash rarely "studied" the problems he worked on, preferring to prove everything from scratch rather than read what others had already done. And it was this originality that led him to his greatest insights.

Nash's work on game theory, for a doctoral thesis at Princeton, provided a new basis for modern mathematical economics. Princeton's John von Neumann, who invented game theory, had searched in vain for ways to make it apply to the real world of economic competition. When young Nash brashly proposed a solution to the problem, von Neumann rejected it. But Nash demonstrated that decentralized decision-making could be analyzed rationally, and revolutionized economics.

At the age of 30, a year after marrying an adoring physics student, and as he was about to be made a full professor at MIT, Nash began acting irrationally, threatening his wife for hiding secrets from him, complaining that aliens from outer space were ruining his career, declining an academic offer from another university because, he said, he was soon to become the emperor of Antarctica.

Nash had always been odd, described by others as aloof, spooky, enigmatic. So for several months his pregnant wife, Alicia, was torn by fears for his sanity and doubts about the consequences of seeking psychiatric help. When she had him committed to a mental hospital, some of Nash's colleagues and friends attacked her and insisted he was sane. Nash, in fact, got a lawyer and a psychiatrist to convince a judge that he was sane; he was soon released.

The years that followed were a nightmare of erratic wanderings, delusions, intermittent jobs secured by academic friends, incarcerations and therapies, and eventually a kind of implosion into a strange solitude. For almost two decades, while his fame spread among economists, Nash wandered the Princeton campus as a wraith, a gaunt figure known as The Phantom who scribbled bizarre notations on blackboards, haunted the library and sometimes turned up at academic teas.

Throughout all these terrible years, Alicia followed him, protected him as best she could, raised their son and gave Nash a home. The strain on her was enormous. Several times she had him committed to asylums, but refused to authorize shock therapy, which Nash feared would impair his memory. At one point she divorced him but continued to shelter him as a "boarder." Her pain was doubled when their teenage son, Johnny, a promising young mathematician, was struck by schizophrenia.

As Alicia did, the Princeton community sheltered Nash with compassion. When he wandered into the computer center, students taught him some basics and left him alone. And then, miraculously, in the late 1980s Nash began to recover his sanity. A student at the computer center recalled: "In the early stages he was making up numbers out of names and being worried by what he found. Gradually, that went away. Then it was more mathematical numerology. Playing with formulas and factoring. It wasn't coherent math research, but it had lost its bizarre quality. Later it was real research."

Then, in October 1994, Harold Kuhn, a mathematics professor at Princeton and Nash's closest friend, conveyed some incredible news. "I have something to tell you, John," he began. An important telephone call, Kuhn informed Nash, would be coming from Stockholm, from the Executive Secretary of the Swedish Academy of Sciences: "He's going to tell you, John, that you have won a Nobel Prize."

Nash later described his own recovery as requiring the same kind of willpower as dieting: "If one makes an effort to rationalize one's thinking, then one can simply recognize and reject the irrational hypotheses of delusional thinking." And in this same vein, while he now spends much of his life devotedly caring for and nurturing his 38-year-old schizophrenic son, Nash says, "I don't think of my son . . . as entirely a sufferer. In part, he is simply choosing to escape from the world."

Considering the life of John Nash makes any academic debate about pure logic and intelligence seem dry indeed. For all his faith in rational behavior, Nash's mind would not have survived were it not for Alicia's great love, and he seems to have learned this lesson. Now in his 70s, with an office at Princeton to pursue mathematics, he finds his real place at home. He sets his clock by Alicia, Nasar writes: "Stubborn, reserved, self-centered, and jealous of his time (and money) as he is, Nash does nothing without consulting Alicia first, defers to her wishes, and tries to help her, whether it is by washing the dishes, straightening out a problem at the bank, or going with her to family therapy every Monday night. She is the one to whom he faithfully reports the day's events, whom he ran into, what the lecture was about, what he ate for lunch. They argue about money, the housework, Johnny, social engagements, but he has committed himself to making her life easier and more joyful." ♜

Paul Trachtman is based in New Mexico.

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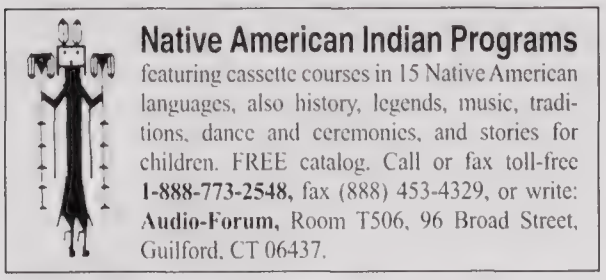
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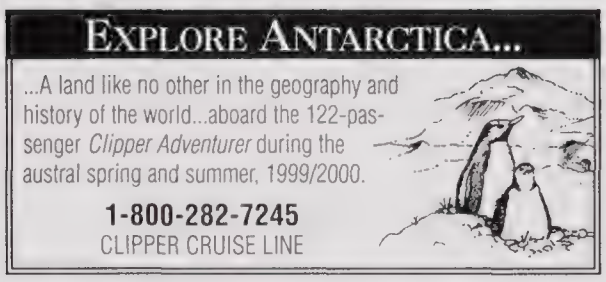
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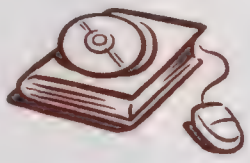

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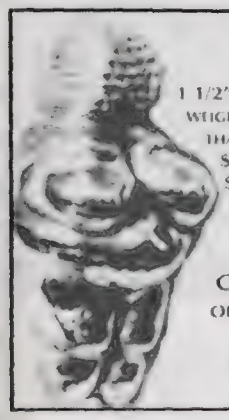

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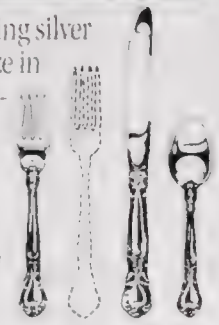

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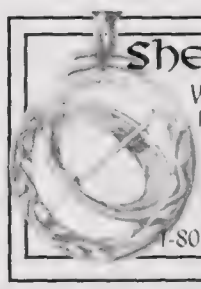

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SMITHSONIAN (ISSN 0037-7333) is published monthly by the Smithsonian Associates, 900 Jefferson Drive, Washington, DC 20560.

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Editorial offices are at 900 Jefferson Drive, SW, Washington, DC 20560 (202-786-2900). Advertising and circulation offices are at 420 Lexington Ave., New York, NY 10170 (212-490-2510). **Subscription Prices:** United States and possessions: $24 a year payable in U.S. funds. Canada and all other countries: add $13 (U.S. funds) for each year. 80 percent of dues is designated for magazine subscriptions. Current issue price is $4 (U.S. funds). Back issue price is $5 (U.S. funds). Periodical postage paid at Washington, DC and additional mailing offices. **Mailing Lists:** From time to time we make our subscriber list available to companies that sell goods and services by mail that we believe would interest our readers. If you would rather not receive such mailings, please send your current mailing label, or an exact copy, to: SMITHSONIAN, Mail Preference Service, P.O. Box 420311, Palm Coast, FL 32142-0311. **Subscription Service:** Should you wish to change your address, or order new subscriptions, you can do so by writing SMITHSONIAN, P.O. Box 420311, Palm Coast, FL 32142-0311, or by calling 1-800-766-2149. Postmaster: Send address changes to SMITHSONIAN, P.O. Box 420312, Palm Coast, FL 32142-0312. Printed in the USA.

THE LAST PAGE

Don't Call Me Gerald

BY GERALD DUMAS

MY FATHER'S NAME WAS FLOYD, which I never much cared for. I didn't like my first name, either, and in third grade I went around asking everyone to call me Buck, but nobody did. Cecil Ferguson said, "If I'm stuck with mine, you're stuck with yours."

There were a lot of Shirleys and Deannas back then, all because of the movie stars Shirley Temple and Deanna Durbin. About the time I was christened Gerald, so were a load of other boys; I've long wondered who the Gerald was I have to thank for it. I've discovered no actor or sports hero who would account for it. The only Gerald I can recall on the national scene at that time was Gerald L. K. Smith, a radio rabble-rouser who certainly had his fans, but if you were a thoughtful person, you did not want to be one of them.

My mother was quite a rabble-rouser herself, but the only radio programs she listened to were the "Telephone Hour" and a soap called "The Story of Mary Marlin." If I had been consulted, I would have chosen Marlin over Gerald. It's a little better, although not much.

As quickly as the fashion for Gerald came, it went. There was an occasional Gerald in the movies, but he always turned out to be a tender and crusty father, like Thomas Mitchell in *Gone With the Wind*, or a butler played by old Melville Cooper. Try to imagine John Wayne or Clint Eastwood, or any other western hero being called Gerald. Impossible. It was always Nathan or Jess or Big Jake

Try to imagine John Wayne being called Gerald, or Clint Eastwood. Impossible. It was always Jess or Jake.

(Jacob is second only to Michael in baby-boy name popularity at the moment) or The Man From Nowhere, a name I would have dearly loved back in the days when I wanted to be called Buck.

Most Geralds start being Jerry somewhere along the line, but while Gerald seems ponderous, Jerry seems light and a bit fey. Today I'm Jerry to everyone except my brother Carl (he tried Karl briefly), for whom old habits die hard.

The only other people who refer to me as Gerald are men with deep, confident voices. They usually call around dinnertime.

"Gerald? This is Conrad. How are you tonight?"

"Not good."

"This will only take two minutes. Do you have two minutes to secure your financial future?"

"I'm dying."

"Gerald, I have a proposal that will change your life."

"How did you get to be called Conrad?"

Caught off guard, Conrad fights for conversational control, loses and hangs up. But I truly want to know.

For many years Mort (Addison Morton) Walker and I wrote the comic strip *Hi and Lois*, which Dik (*Hagar the Horrible*) Browne drew. One day, watching Dik ink a strip, I asked, "Why'd you take the "c" out of Dick, Dik?"

"Just to be different," Dik answered forthrightly.

Another popular cartoonist, Bil Keane, dropped either the first or second "l" from his name—I've never been sure which. And he didn't stop there. Giving a speech one evening, he said, "Hello, I'm Bil Cartoonist Keane. That's a little idea I picked up from Francis Cardinal Spellman."

Sometimes I think we should all go back to names like that—names that describe ourselves. Baldy the Blacksmith. Richard the Lion Hearted. Ethelred the Unready. But then I recall how my little schoolmates, heartless and callous, would cheerfully mispronounce my last name—Gerald the Dumas.

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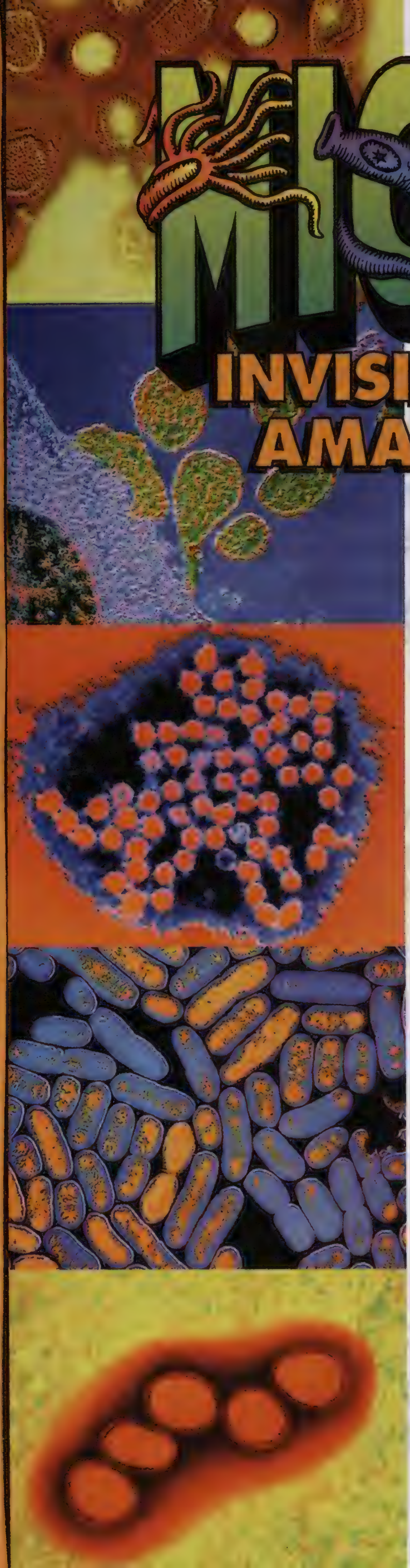


MICROBES

INVISIBLE INVADERS AMAZING ALLIES

Come see the fascinating world of microbes up close and personal with this special 3-D poster!

Simply open this insert, put on your glasses and meet a microbe - staphylococcus epidermidis, to be exact! This amazing photograph was taken with an electron microscope and the image you see has been magnified approximately 65,000 times. This bacterium is normally harmless, but if it makes its way into broken, cut or punctured skin, it can cause an infection.

The smallest form of life on Earth is the microbe. Although microbes have existed for millions, even billions, of years, their presence was not detected until the seventeenth century. In 1683 Dutch merchant Antony van Leeuwenhoek, who made microscopes as a hobby, detected "wee animicules" in scrapings from his teeth. Another 200 years would pass, however, before scientists would establish the relationship between microbes and disease.

Although some microbes are deadly, most are harmless, and some are extremely helpful. These microscopic organisms can be found virtually anywhere – in air, water, plants, animals and humans.

Grouped by physical and behavioral characteristics, microbes fall into the following major categories:

Viruses (singular: virus) are the smallest and simplest microbes, just a ball of genes wrapped in a shell – about a millionth of an inch across. No one knows how long they've been on Earth or how they evolved. They reproduce by injecting their genes into a cell to produce thousands of new viruses. Some diseases caused by viruses are the flu, the common cold, chicken pox, and measles.

Bacteria (singular: bacterium) are much larger than viruses – about 125,000th of an inch long. If a virus were human-sized, a bacterium would be about as big as the Statue of Liberty. These one-celled bodies either make their own food through chemical processes or feed on live hosts or dead matter. Bacteria have existed on Earth for more than 3.5 billion years. Some diseases caused by bacteria are tuberculosis and strep throat.

Fungi (singular: fingus) In nature, fungi are decomposers. They break down matter into nutrients and minerals that plants and animals reuse. Of the 100,000 known species of fungus, familiar examples include mushrooms, yeast, mold and mildew. A disease caused by fungus is athlete's foot.

Made possible by Pfizer

Life is our life's work.

Welcome to the world of microbes. Microbes are life forms so small you can't see them without the help of a microscope. But just because you can't see them, doesn't mean they're not around! In fact, microbes are everywhere -- in the air, on your skin, in your bed, in the food we eat and the water we drink. They are even inside our bodies. Without them we would have no oxygen to breathe and no food to eat.

Microbes play a crucial role in our everyday lives and help keep life as we know it in balance. They break matter down into nutrients and minerals that plants and animals can reuse. Other microbes digest oil and pesticides and help keep the environment clean. Some microbes even come to your defense when you get sick! In fact, the first antibiotics came from microbes.

But sometimes microbes do make you sick. They cause everything from the common cold to Ebola. For something you can't see, they can be frightening and destructive. Thanks to breakthrough research, science has defeated many of the microbes that once caused millions of deaths through plagues and epidemics. That's why at Pfizer, scientists search for new cures and treatments that will improve and even save the lives of people around the world. But our work is never done. We will always keep working to stay one step ahead of infectious disease.

We hope that the information on this poster will help you stay healthy and strong the next time you get into a battle with a microbe! That's also why Pfizer is sponsoring *Microbes: Invisible Invaders...Amazing Allies*, a traveling museum exhibit that teaches people about the different kinds of microbes, why they can make you sick, and what you can do to stay healthy. For more information about our *Microbes* exhibit, please turn to the back page of this poster.

We now invite you to explore the mysterious world of microbes. Open your poster, put on your glasses and experience this fascinating world in 3-D!

Sincerely,

Randall E. Kaye, M.D.
Director, Pediatric Health

Meet Your Bodyguards...

Every day you come into contact with thousands and thousands of microbes. Some of these microbes can make you sick. Here's how your body helps protect you from getting sick:

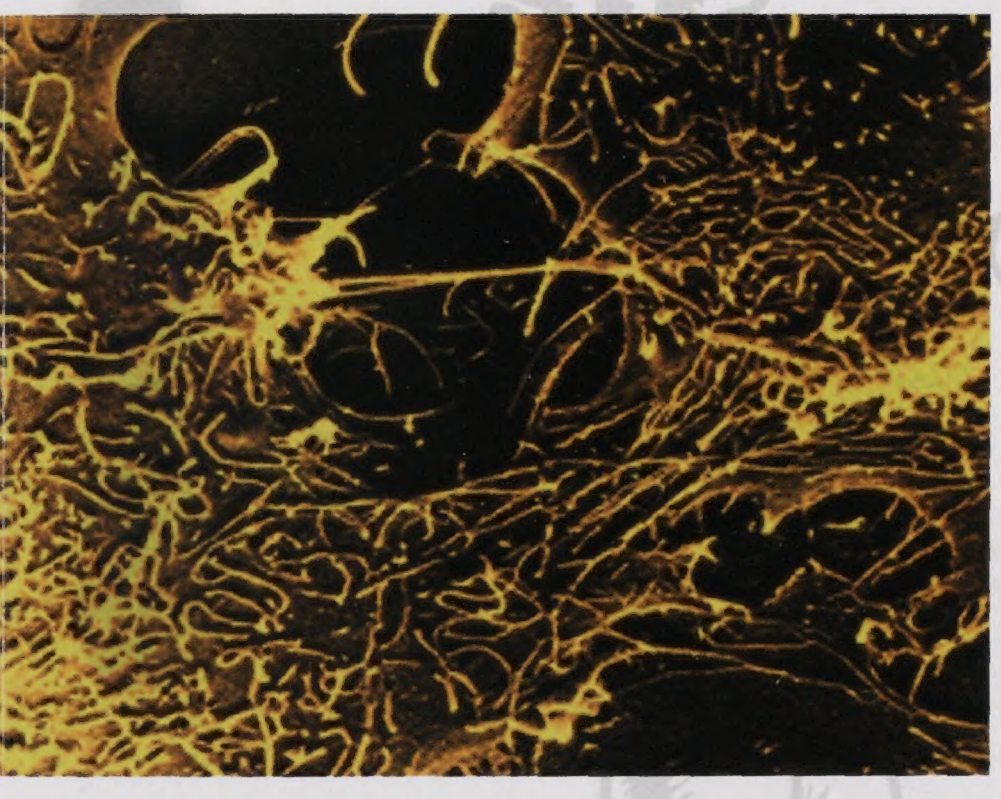
- Skin is our first line of defense. This tough barrier keeps most microbes out.
- Antibodies are the immune system's advance scouts. They are y-shaped molecules that travel throughout the body looking for invading microbes. When they find them, they grab them and disable them.
- White blood cells are the immune system's big guns. Alerted by antibodies, they track down microbes and destroy them.
- Hormones are molecules that help stir up and deploy our immune system forces.
- Our stomach and intestines produce strong acids and enzymes that kill microbes on contact.

Here's What You Can Do To Stay Healthy....

- Wash your hands!
- Eat a healthy diet and exercise. This will keep your body and your immune system strong.
- If you do get sick and your doctor prescribes an antibiotic, make sure you finish all of your medicine. That way those "bad" microbes won't come back to bother you again!

Mixed Up Microbes

BIEMCRO	An organism that is so small you need a microscope to see it.
RVSUI	The smallest of all microbes.
TONIATIBCI	A medicine that kills microbes or stops their growth. Sometimes, your doctor will prescribe one when you get sick.
INSK	Your bodies first line of defense against microbes.
NTBAODIESI	Special microbe-fighting proteins in your blood. By attaching to invading microbes, they help white blood cells spot invaders and "eat" them up.
RMSOOCCIPE	An instrument that magnifies small objects.



What's Hiding Here

Circle all the words you can find. You'll find some forward, backward, diagonally and upside-down.

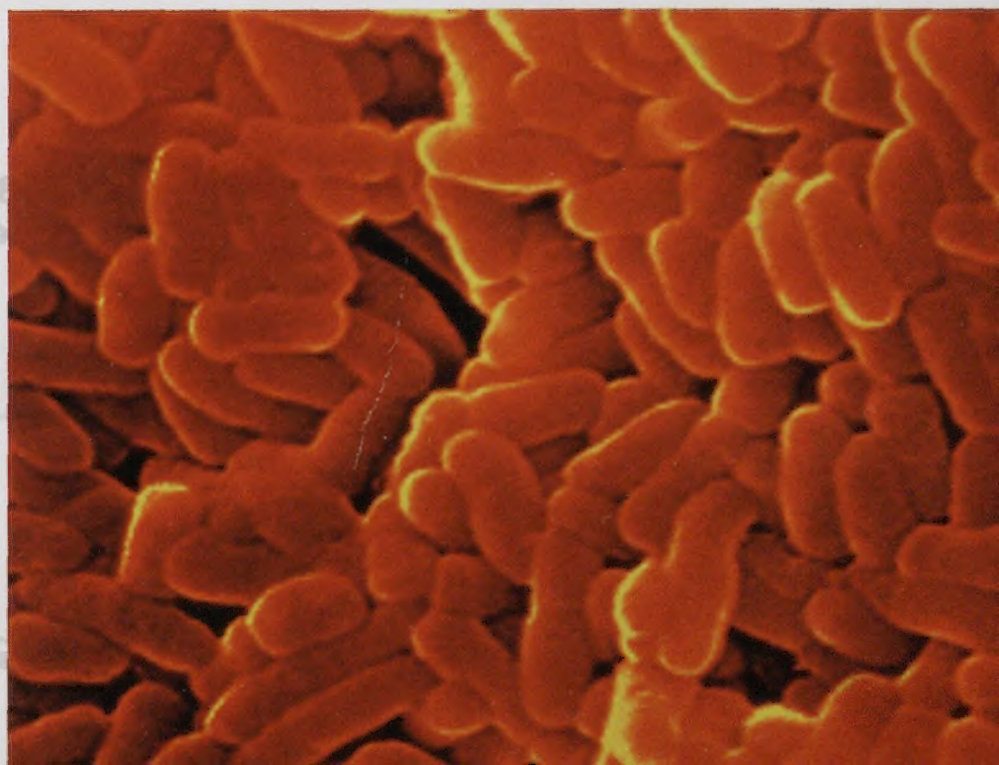
J H C I T O I B I T N A
M D N A B A C T E R I A
I M M U N E S Y S T E M
C P O V A C C I N E M V
R P R L M A I K O U L X
O B H O D U F U N G U S
B P D A T C S T R A I N
E L S E G O G H Y C E E
R A D F W E Z N R R T G
E G R E M E Z O M O X E
Q U I P A Y B E A N O R
T E V S T S A E Y N U M

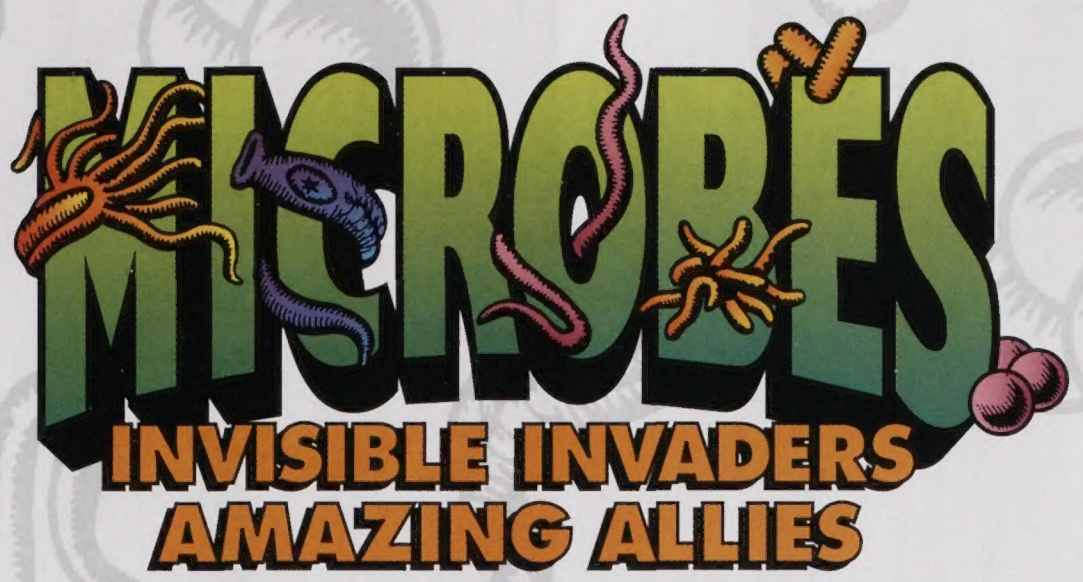
Look for these microbial words.

antibiotic	mushroom	bacteria
phage	DNA	plague
emerge	protozoan	fungus
strain	germ	vaccine
immune system	virus	microbe
yeast	mold	

Did You Know?

- On one square-inch of our bodies, there are as many as 10,000 bacteria.
- Scientists may have found signs of microbial life on Mars.
- When you sneeze, air rushes out of our nose at a speed of about 100 miles per hour!
- Without microbes you couldn't digest your food. Inside your stomach and intestines billions of microbes break down food into nutrients that your body needs and make digestive gas in the process.
- When you eat a bowl of yogurt you are eating live bacteria!





Will *Microbes* invade a city near you?
Be on the lookout for *Microbes: Invisible Invaders...Amazing Allies!*

Experience the good, the bad and the funny-looking as the microbial universe becomes larger-than-life at *Microbes: Invisible Invaders...Amazing Allies*, a major educational science exhibit sponsored by Pfizer. This 5,000-square-foot traveling exhibit presents a close-up look at the intriguing, mysterious, and sometimes deadly world of microbes.

At *Microbes*, you will explore the hidden world of bacteria, viruses, fungi and protozoa using video games, computer graphics, virtual reality and countless hands-on activities. At the exhibit, you can battle bacteria and fight infections with computer-assisted artillery, travel through time to see how infectious diseases have affected civilizations throughout history and shrink down to microbe size to see just how spectacular microbes look up close and personal.

Separating fact from fiction, *Microbes* provides a hands-on, kid-friendly, educational experience for visitors of all ages. Please see the venue list below to find out when *Microbes* will invade a city near you!

May 23, 1999 - Sept. 6, 1999	Smithsonian Institution (International Gallery) Washington, DC
Oct. 22, 1999 - Jan. 9, 2000	Nature Museum of the Chicago Academy of Sciences Chicago, IL
Jan. 28, 2000 - April 23, 2000	The Buffalo Museum of Science Buffalo, NY
May 20, 2000 - August 27, 2000	Great Lakes Science Center Cleveland, OH
September 16, 2000 - January 7, 2001	Museum of Discovery & Science Fort Lauderdale, FL
February 10, 2001 - May 13, 2001	The Children's Museum of Indianapolis Indianapolis, IN
June 8, 2001 - September 3, 2001	Space Center Houston Houston, TX
October 6, 2001 - January 6, 2002	Franklin Institute of Science Philadelphia, PA
February 2, 2002 - May 5, 2002	St. Louis Science Center St. Louis, MO
June 1, 2002 - September 8, 2002	Kansas City Museum Kansas City, MO
October 5, 2002 – January 5, 2003	Science Museum, Boston Boston, MA

To learn more about the fascinating world of microbes, please visit www.pfizerfunzone.com and www.pfizer.com/rd/microbes

MICROBES
INVISIBLE INVADERS
AMAZING ALLIES

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